ELECTRICAL REVIEW

and WESTERN ELECTRICIAN with which is consolidated ELECTROCRAFT

VOL. LXVI, No. 20. CHICAGO, SATURDAY, MAY 15, 1915. ISSUED WEEKLY

COMPRISING

ELECTRICAL REVIEW WESTERN ELECTRICIAN ELECTROCRAFT

ELECTRICAL REVIEW PUBLISHING COMPANY, INC.

608 SOUTH DEARBORN STREET
CHICAGO

Charles W. Price, President and Treasurer.
A. A. Gray, General Manager. H. S. Tuthill, Business Manager.
C. W. Forbrich, Assistant Business Manager.

E. E. Wood . . . . . 13 Park Row, New York, N. Y.
Manager Eastern States.
J. B. McCarthy . . . . . Detroit, Mich.
Manager Middle States.
C. W. Forbrich . . . . . Chicago, Ill.
Manager Western States.

ELECTRICAL REVIEW AND WESTERN ELECTRICIAN

Charles W. Price.....Editor-in-Chief
A. A. Gray.....Managing Editor
Morton Githens Lloyd.....Technical Editor
F. H. Bernhard.....Associate Editor
Howard Ehrlich .....Associate Editor

MEMBER SERVICE THE SOCIETY FOR THE ELECTRICAL DEVELOPMENT OF NEW YORK SAFETY
DO IT ELECTRICALLY

SUBSCRIPTIONS.

One Year, United States $3.00
One Year, Canada 4.00
One Year, Foreign Countries 6.00
Single Copy, 10 cents. Back one month, each.. .25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879

CONTENTS.

EDITORIALS:
Cultivating Appliance Business.....889
Commercial Engineering 890
Specializing in Distribution Work.....890
An Opportunity for Co-operation.....891
Co-ordination 891
DEPARTMENTS:
Commercial Practice 898
Electrical Construction 901
Public Service Commissions.....905
Legal Notes 908
Questions and Answers.....909
New Electrical and Mechanical Appliances.....921
Current Electrical News.....927
Record of Electrical Patents.....931
LEADING ARTICLES:
Electricity in Woodworking Plants.....893
Wiping a Lead-Covered Cable.—By H. E. Weightman.....901
Electrical Engineering Problems.—By R. G. Hudson and W. V. Lyon.....911
LETTERS TO THE EDITOR:
The Illuminating Engineering Society.—By Clayton H. Sharp and W. D. Weaver.....918
MISCELLANEOUS:
Notable Electrical People Meet Death on Lusitania.....892
Annual Meeting of American Institute.....892
Presentation of First Franklin Medals.....892
Telephone Connection Between Los Angeles and New York.892
Program of Ohio New-Business Convention.....897
Philadelphia Company Issues Vehicle Booklet.....897
New England Contractors and Central-Station Men Hold Co-Operative Meeting.....898
Card Index Increases Efficiency of New-Business Department.....899
Fan Searchlight Provides Novel Window Display.....903
Fred G. Dustin Enters Contracting Field.....904
Among the Contractors.....904
Electrical Prosperity Week Meeting at Toledo.....908
Edison Awarded Medal of Civic Forum.....910
Details of Michigan Section Convention Cruise.....913
General Electric Annual Report.....914
Overhead Construction Work at Khopoli, Bombay.....914
Staff Organized to Handle "Electrical Prosperity Week" Campaign.....916
Illumination of Ohio State Capitol Building.....916
Meeting of New York Central-Station Men.....917
Annual Meeting of Society for Electrical Development.....917
New Home of American Museum of Safety.....920
Conference of Metermen at Sandusky.....920

Copyright, 1915, by Electrical Review Publishing Company, Inc.

CULTIVATING APPLIANCE BUSINESS.

Central-station managers comparing the cost of obtaining revenue from the use of electric appliances with the expense of securing power and lighting income are sometimes surprised at the disparity in outlay for each dollar of earnings from these different classes of service. It may cost, figuring all items, from 60 to 75 cents per dollar of revenue to gain income from the use of electric appliances, against say, from 10 to 12 cents per dollar of power and lighting income. The immediate conclusion is that the cultivation of the former is hardly worth while. "Let us go after the power and lighting business," says the manager, "and leave this small stuff to develop itself or to be developed through the efforts of the local contractors and supply houses."

It is an open question whether a central station should try to gradually eliminate the appliance business as a retail factor in its organization, but we cannot for a moment see any wisdom in losing interest in this kind of work and in failing to push it hard. There are central-station men who have quit the sale of appliances entirely in the belief that this belongs naturally to the supply dealer and who are glad to get rid of the care and expense of maintaining a display room. In cases where the supply man is energetic, this policy may be the logical one to adopt; but whether the central station retails electrical conveniences or not, active campaigning should be maintained without relaxation.

All these devices which go into service advertise electricity by their successful use more than most central-station men of the former class realize, and again, many of them are exceedingly profitable from the standpoint of load-factor. It may cost five or six times as much to get a dollar of income from the washer or electric iron than it does to earn a dollar from house lighting, but it may cost the company scarcely anything except operating expenses to supply the former service. Net income after the cost of operation has been met is a pretty significant affair, and it will not do to belittle the earning power of appliances multiplied through a city or town when the time of day in which the demand occurs is taken into consideration. No, the progressive central-station man realizes that every corner of the electrical field which shows a possible profit is worth cultivating, and until the millennium of the electrically saturated community arrives, it will pay to work hard for every dollar of net profit latent in the territory

of the modern central station. Some solicitors are best fitted to specialize in factory power, others in introducing domestic appliances, and the far-sighted manager is the one who lets no grass grow under his feet in pushing every possible line of attack on the absorbing powers of his customers.

COMMERCIAL ENGINEERING.

The announcement by the School of Applied Science of New York University of the establishment of a full four-year course in industrial engineering, leading to the baccalaureate degree, indicates the growing interest of educators in the "business" side of engineering. There is no question that in the past many of the fundamental business usages have had to be acquired by engineers by hard knocks after graduation from their technical courses, and many a man well grounded in the determination of hysteresis losses and the calculation of voltage drop in transmission lines under different conductor spacings has come to a point in his career where he had to confess, let us hope to himself, that he did not know the difference between a bond and a share of stock, or the distinction between a note and a mortgage. Many such men have had to toil far into the night to fit themselves for handling problems arising in industrial accounting, factory organization or shop management, and not a few have made up for early lacks in this sort of training by months of patient effort. Without doubt their technical courses gave them the mental training needed to conquer these unfamiliar fields, but they have felt that if the general principles of the business side of engineering could have been imparted earlier, much would have been gained.

Relatively few men taking an electrical course, for example, can expect always to confine themselves to highly specialized technical duties. With the advance of the art the need of men who can utilize equipment to greatest advantage becomes greater, and the opportunities opened to those competent to apply the scientific developments of the laboratory and the factory grow broader. The cost element is always present in engineering, but there is a wide difference between the work of the sales engineer, for instance, and that of the designing engineer in the factory. The former needs a better grounding in the problems of accounting, credit and elementary banking methods, the economic aspects of industry, and the relations of different lines of business to the specialty in which he works. In some cases this commercial engineering activity has been looked down upon by the men more keenly interested in scientific matters, but it is a high order of work none the less, deserves the utmost respect for the peculiar qualifications demanded, and goes a long way to keep the more theoretical man steadily employed.

We hold that a power engineer in the commercial department of a central station is doing just as much in his way to push the world ahead as the specialist in designing interpole motors for variable-speed machine-tool operation. Each should appreciate the need of the other, and it is a good sign that the educational world is coming to see that a somewhat different training may be desirable in each case. While it is true that a man with a superficial knowledge of technical matters is apt to be a dangerous person to be put in charge of men doing intensely technical work, it is none the less a fact that for some undergraduates a curriculum which leaves out some of the more advanced technical studies and includes the principles of modern business and executive organization, the economics of production and distribution, may afford far better preparation for subsequent duties than the training needed by the technical specialist.

SPECIALIZING IN DISTRIBUTION WORK.

An interesting example of the extent to which specialization has entered electric distribution work is afforded in recent evidence presented by the Bay State Street Railway Company before the wages arbitration board at Boston, Mass. On this system, one of the largest electric railways in the world, one of the engineers of the electrical staff gives his entire time to problems of the return circuit. He supervises tests of all rail joints, almost a third of a million in number; compiles records of rail-joint condition, keeping the engineer of maintenance of way in touch with necessary replacements of bonds; prescribes the type of bonds necessary and generally supervises the method of installation employed for the various types; tests the comparative efficiency of different kinds of bonds and prepares specifications to be followed for their purchase and placing in the track.

The "return-circuit engineer," as he is called, prepares plans prescribing the method of laying and location of supplementary wires around special track work and generally supervises the installation of these. He performs such engineering work as is necessary to determine the additional negative conductors required, supervises the engineering work and tests in relation to the prevention of electrolysis and co-operates in this with the engineers of other companies.

Inevitably the amount of work associated with the return circuit is, of course, very large, on a system operating 940 miles of track, and justifies maintaining a specialist in this exceedingly subdivided branch of engineering. While the problems dealt with originate with electric railways, it is an excellent thing for other public utilities and for municipalities that the subject of the return circuit is regularly accorded such scientific treatment and that the prevention of damages to underground structures goes hand in hand as a matter of routine with efforts to maintain the minimum economical loss of electrical energy in railway power distribution by direct current.

AN OPPORTUNITY FOR CO-OPERATION.

Many electrical men are weary of the very word co-operation, so much has been said about it at meetings and conventions, and if someone would find a good synonym for this always essential thing in business relations, doubtless the results would be beneficent. Whether we like the reiteration of the word or not, it is absolutely impossible to get along without team play in a great industry like ours, and every time an honest effort is made to rub out differences between men of affairs in the central station and contracting fields the welfare of the industry is heightened.

There is a good deal of lost motion, however, in trying to accomplish specific results in co-operation. Central-station men and contractors appreciate the desirability of getting together, but a good many meetings fail to accomplish anything constructive because there is insufficient discussion of real problems. Why not have a meeting of this kind at which every central-station man and every contractor with a grievance will send in a brief anonymous statement of his troubles to a small committee in charge of the discussion, throwing these specific instances open for attack and defense without attacking names or places? In this way no local central-station man could feel that the contractor was trying to discredit him at the meeting by criticisms, and the same thing would apply to the contractor.

Let a small contractor, for instance, send in a brief statement bearing upon the troubles he encountered because the local lighting company undersold him on appliances in a three-week campaign, and let the floor be open for the frank discussion of the pros and cons of this policy. If the matter is handled thus informally without calling names—and the facts are all that are needed to promote discussion—a whole lot of good give and take is bound to follow. Let us call a spade a spade in smoothing out the rough places in mutual relations, clear the air of generalities when these tend to thicken about us, and all try to grasp the other fellow's point of view in stoutly and properly advancing our own legitimate claims.

CO-ORDINATION.

While co-operation is just the thing wanted and is quite the proper term to use with respect to mutual effort between different groups having a common aim, as is or should be in the case of the different electrical interests; when we come to consider similar mutual effort within a particular organization, it is really co-ordination that is mostly wanted. It is assumed, of course, that all hands within any commercial organization have the same aims, and the achievement of these aims will depend largely upon the proper co-ordination of effort in different departments or by different individuals.

Thus in a supply business the efforts of salesman, credit man, stock man and shipping clerk may be largely wasted in friction unless there is proper co-ordination. In the contractor's business the solicitor, estimator, stockkeeper and foreman are similarly dependent upon each other's efforts. In the central station, co-ordination of effort between the contract, construction, meter and operating departments is essential to smooth operation. And so on in all lines. Nothing so hurts the reputation of any concern in the eyes of a customer as to have one official or employee promise some service which must be executed by another and have this promise go unfulfilled.

How is co-ordination to be achieved? In the first place any organization must have definite policies and methods adopted by competent officials and adhered to consistently throughout. Such adherence requires an intelligent understanding and appreciation of those policies by all employees concerned. It is not sufficient for some head of a department to be given specific instructions and have them go no further. Every employee coming into contact with the public must know what attitude he should take toward the public on certain questions and all employees should understand just what their relations should be to other departments.

We have known instances of solicitors being sent out absolutely without instructions, or else with very inadequate ones, the principal admonition being to "get business." We have known employees to make promises without any knowledge as to whether other responsible employees could or would meet those promises. There can be no co-ordination under such circumstances.

Again, proper division of the field of work requires co-ordination. Otherwise there is wasteful duplication of effort. This is best illustrated by the division of territory among solicitors. But the same idea can be applied in manifold ways.

Complete co-ordination can only be realized when each employee is thoroughly informed as to what is expected of him and enthused with the determination to carry out the ideas of his superior. Policies and plans must be thoroughly explained, and each employee made to feel that he is a cog in the machine every element of which must do its part for their complete realization. Failures are due quite as often to neglect of these prerequisites as to incompetence or unwillingness on the part of employees. In these times when our public-school methods are such as to largely suppress originality and initiative among developing men, we cannot expect these qualities to loom large among subordinates; and anyhow it is the function of the executive to initiate, and to secure co-ordination among the corps of assistants who must be depended upon to carry out his plans.

Initiative should unquestionably be encouraged among subordinates, and should be highly valued when found, but unless such initiative be applied with an understanding of the underlying policies of the organization it is likely to lead to embarrassing situations. Under these conditions both the subject and his employer are likely to take a distorted view of the desirability of well intentioned effort on the employee's part.

Notable Electrical People Meet Death on Lusitania.

Among those who met death last week in the destruction of the Cunard steamship *Lusitania* upon being torpedoed by a German submarine, were Isaac B. Trumbull, secretary and treasurer of the Connecticut Electric Manufacturing Company, Bridgeport, Conn.; Dr. Fred Stark Pearson, one of the leading consulting engineers of the country, and Elbert Hubbard, scholar, essayist and publisher, all intimately connected with the electrical industry.

Dr. Pearson was the head of the Pearson-Farquhar Syndicate, and the operations of this company have extended into many quarters of the globe. He was born in Lowell, Mass., in 1861. He was educated at Tufts College, and later became instructor in the Massachusetts Institute of Technology. He returned to Tufts College to complete his course, graduating with diplomas in chemistry and civil, electrical and mining engineering. After graduation he became manager of the Somerville Electric Light Company, later becoming consulting engineer of the Brooklyn Heights Railway Company. The following year he became chief engineer of the Metropolitan Street Railway Company, of New York City. More recently Dr. Pearson has been directly interested in the construction of properties in South America and in Mexico. Mrs. Pearson, concerning whose fate there has not been any direct information, accompanied Dr. Pearson on the trip. She was formerly Miss Mabel Ward, of Lowell, Mass., and was married to Dr. Pearson on January 5, 1887.

Elbert Hubbard was born in Bloomington, Ill., June 19, 1859. For a long time he made a more or less precarious living as a writer and as a printer of choice editions of the classics and his own quaint philosophy. He lectured a good deal and later on established a printing and publishing plant at East Aurora, N. Y., which soon became the center of an artistic community and Hubbard, riding on a wave of personal success, soon found himself prosperous. He has been familiarly known as the "Sage of Aurora," and the "Fra." Many of his publications have reached astounding numbers in the editions that have been published and distributed. His "Message to Garcia" probably attracted more attention than any other single literary effort the world has known. It will be remembered that George C. Daniels, then general passenger agent of the New York Central Railroad, bought and distributed one million copies of this little book. Hubbard was an ardent Jovian, and numbered among his close friends and acquaintances a host of electrical people. His passing will be particularly unfortunate, as the Roycroft institution, of which he was the inspiration and the main stay, will find it hard to in any way compensate for his departure. Mrs. Hubbard, who accompanied her husband, is also among those missing after the disaster.

Mr. Trumbull was only 31 years of age and was one of seven brothers, all of whom are identified with the electrical business. In addition to his connection with the Connecticut Electric Manufacturing Company, he was president of the American Cycle Car Company, of Bridgeport. It was upon the business of the latter that he was bound to Europe when death overtook him. He is survived by his widow, his daughter Priscilla, both of Bridgeport; his father and mother, residents of Plainville, Conn.; his brothers John and Henry, heads of the Trumbull Electric Manufacturing Company, of Plainville; James, of Saranac Lake; George, of Bantam, Conn., of the Trumbull-Vanderpoel Manufacturing Company; Frank, of Bridgeport, and A. H., of Stratford. The two latter are the surviving heads of the Connecticut Electric Manufacturing Company.

Annual Meeting of the American Institute.

The 309th meeting of the American Institute of Electrical Engineers will be held in the Auditorium of the Engineering Societies Building, New York City, on Tuesday, May 18, at 8:15 p. m. This is the regular annual business meeting of the Institute, at which the Board of Directors will present its report for the fiscal year ending April 30, 1915. Copies of the report will be distributed and will include a detailed statement of the financial status of the Institute and a summary of the work accomplished by the standing and special committees during the year. The Committee of Tellers will present its report on the result of the election of officers for the coming administrative year.

Following the business meeting will be the presentation of the Edison Medal to Alexander Graham Bell. The presentation address will be made by John J. Carty.

An address will then be given on "How Bell Invented the Telephone" by Thomas A. Watson, who was associated with Dr. Bell in the early development of the telephone.

War and Coal Costs.

An illustration of the effect of war upon electricity coal costs in the United Kingdom is found in the case of Edinburgh where 40,000 tons have been ordered for the coming year at an advance of $50,000 on last year's prices.

Wireless Now Open with Canal Zone.

The first daylight message from the new naval radio station at Darien, in the Panama Canal Zone, to the Navy radio station at Arlington, near Washington, was received on April 30. It was the first official message between these two links in the chain of high-powered radio stations that the navy will have in operation between Washington and the Philippines next winter. Until this was received all messages from the Navy Department to the Canal Zone had to be sent at night and be relayed. In the future these messages will be handled day and night by the new Darien station.

The distance from Arlington the the Canal Zone is 2,000 miles. The sending and receiving radius of the new Darien station is 4,000 miles.

The type of radio installation at the Darien station is the Poulsen arc system, and this station will be the most powerful in the world using exclusively this style of equipment. Since the United States Navy has been in temporary control of the German radio station at Tuckerton, the Poulsen arc system has been installed at that point and is being successfully used there in communicating with Berlin in daylight, as well as by night.

Presentation of First Franklin Medals.

At the meeting of the Franklin Institute of the State of Pennsylvania, on the evening of May 19, awards of the Franklin Medal will be made to Thomas A. Edison and H. Kamerlingh Onnes, the latter being represented by Chevalier Van Rappard.

An address will be made by Samuel Insull, founder of the medal, on "Electricity and Modern Industrial Growth," and the sculptor's model of the medal will be presented to Mr. Insull.

After the meeting the officers and board of managers of The Franklin Institute will tender a reception to Chevalier van Rappard, Mr. Edison and Mr. Insull at the Hall of the Historical Society.

Telephone Connection Between Los Angeles and New York.

On May 6 commercial telephone communication was established between New York and Los Angeles by the American Telephone and Telegraph Company. This service was initiated by the exchange of congratulations between a number of prominent men in the two cities.

This communication involves the use of repeaters at Pittsburgh, Chicago, Omaha, Denver, Salt Lake City and San Francisco.

The rate is $22.20 per three minutes and $7.10 for each additional minute.

Electricity in Woodworking Plants.

This article points out the various advantages of electric motor drive for woodworking establishments, discussing questions to be considered in deciding upon the size and type of motor, as well as whether to install individual or group drive. Disposal of wood refuse and blower installations are also discussed.

The fact that the refuse from woodworking plants can be and is being used for fuel is perhaps responsible for the more or less general conclusion among manufacturers that central-station power is prohibitive in cost. As a matter of fact, in the average plant using kiln-dried lumber the refuse seldom exceeds the amount necessary to operate the kilns and the heating system in winter. The establishments having excessive amounts of wood waste, enough to operate a private power plant and the necessary kilns as well, are in the minority, but even these plants are realizing the advantages of central-station service and are discarding their isolated plants, arranging in some manner to dispose of the refuse.

Extended-Shaft Motor Driving a Buss Planer in Woodworking Factory.

The plant that does not use kiln-dried lumber, such as box manufacturers, planing mills, etc., are usually the most difficult central-station prospects, as the offal can be used exclusively for power-generating purposes. It might be advisable when dealing with such prospects to suggest that a kiln be installed and kiln-dried lumber sold to other woodworking establishments.

This is being done with marked success in a Cincinnati box factory. All wood waste not used for the dry kilns is sold, and the profit from the sale of the dried lumber, kindling, sawdust and shavings pays the entire power bill. The question of the disposal of by-products from any woodworking establishment is fundamentally a local problem, and it would be to the advantage of the central-station power salesmen to investigate the possibilities in this direction and assist the manufacturer in obtaining the best prices for his refuse.

Perhaps livery stables and farmers use the greater portion of by-products for bedding horses and for other purposes around stables. In one plant in St. Louis, Mo., farmers call at periodic intervals for shavings and sawdust, and the revenue from these sales not only pays the power bill, but is actually showing a net profit to the company.

Shavings that are free from rosin may be baled and shipped to pulp mills, and the returns are usually sufficient to pay transportation charges and leave a substantial balance. The local fire departments should not be overlooked as possible users if an excess of sawdust is accumulated. If a separator is used by the manufacturer the small pieces of wood may be sold as kindling, or to other manufacturers requiring such material. Those plants working oak mainly will find a small channel through the bakers. Oak is used quite extensively by bakers in their ovens to

give a suitable flavor to the bread.

A rather unique method of disposing of the by-product is that of mixing iron and steel filings with shavings and sprinkling with salt water. An oxide is thus formed, which is very useful and in demand by gas companies. The iron and steel filings cost about $5.00 per ton, delivered at the woodworking plant. The function of the shavings is to offer a large, useful surface upon which the iron oxide can form. This mixture is then sold to the gas companies, who use it for absorption purposes.

One of the important considerations in the electrification of a woodworking establishment is whether individual or group drive should be employed. While there are advantages and disadvantages in both, it is usually found that a combination of the two is most suitable, where individual motors cannot be installed. Individual drive offers compactness, safety, effective control, and general over-all efficiency by virtue of the reduction to a minimum the slippage of belts and transmission losses. Another important advantage is the convenience in location, so that the sequence of operations can be carried on with no interruption and with a minimum amount of handling; and, lastly, the ability to eliminate power losses on idle machines.

Group drive, on the other hand, offers but one incentive, namely, lower initial cost, since, because of the diversity-factor a smaller motor may be used. The selection of the system must be left largely to the user, after the power engineer has placed all facts before him. Since it should be the aim of the central station to obtain a satisfied customer, and as first cost is quickly forgotten, the power engineer should strongly emphasize the advantages of individual drive, which in most cases outweigh the difference in cost.

Group of Machine Tools at Lyon & Healy Plant.

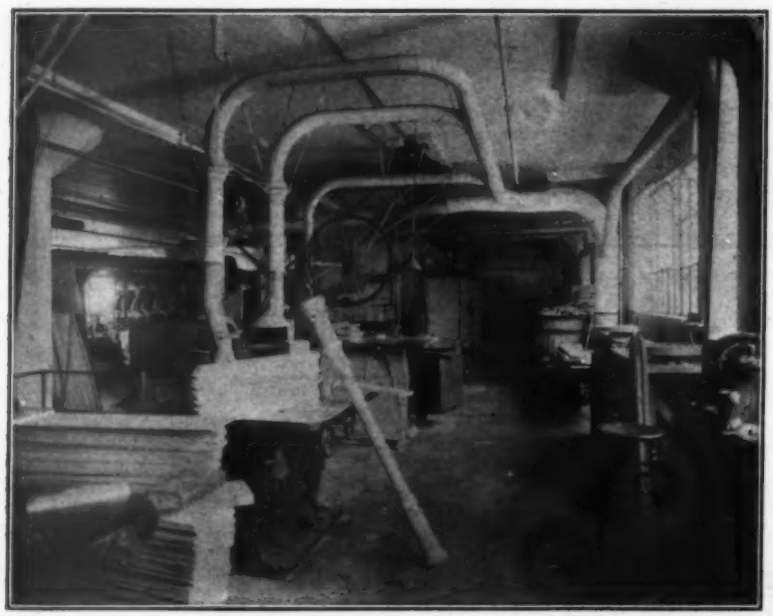
Ordinarily, an important factor in determining the type of motor to use for woodworking drive, and in determining whether group or individual drive is most suitable, is the cycle of operations of the machines under consideration. A swing cut-off saw, for example, starts up with very little effort, works about three to four seconds, and is idle from 15 to 20 seconds. This is the cycle of operation so long as the workable material is available. Quite different, however, are the requirements of the planer, matcher, moulder, and similar machines which have relatively a large amount of inertia to overcome, requiring high starting torque and a fairly uniform stop and start during the day.

With group drive the load-factor or diversity-factor must be considered. The load-factor is problematical, and at best, determining on the proper size motor for group drive is difficult, unless all facts are available regarding the cycle of operation of each particular machine and the order in which the operations occur.

The selection of the proper motors for driving woodworking machines is of the utmost importance, and should be given the proper consideration by power engineers. If only direct-current supply is available, motor should be compound-wound of the inter-pole variety, since it is absolutely essential that the motors be capable of resisting inherently excessive peaks, which are apt to occur during the all-day load of the great proportion of woodworking machinery. Direct-current motors should be totally inclosed, except in those special cases where the driving machines are suspended from the ceiling away from shavings and sawdust, or located in separately partitioned rooms in such manner as to eliminate fire risk.

Large inclosed motors should be artificially ventilated and supplied with piping to and from outlet openings. All controlling appliances, of whatever nature, if exposed to sawdust and shavings, should be totally inclosed.

Where alternating-current supply is available, the polyphase induction mo-



Motor-Driven Band Saws and Shapers, Lyon & Healy.

Motor-Driven Matcher, Lyon & Healy Plant.

tor with high-resistance squirrel-cage rotor should be specified, since the high-resistance rotor permits quick and frequent acceleration, and provides the heavy starting torque required to overcome the inherently great inertia of woodworking machines. The type of alternating-current, polyphase motors with polar-wound rotor and internal starting resistance, while possessing admirable torque and starting-current characteristics, is not generally recommended for woodworking machines, since sawdust almost invariably may be expected to collect on the starting resistance. In a few cases, where variable speed with electrical control is desired, polar-wound internal-resistance rotors with collector rings and external resistances may be used. However, specifications should call for inclosed collector rings.

Owing to the high speed and light moving parts of most woodworking machines, and the frequent violent application of the load, it is desirable to use belt drive, rather than gears or chains, especially as the speed of the driven pulley is usually too high to permit of other than direct or belted connection. The direct drive is coming into general use in many modern plants, and is giving excellent results where the motor has sufficiently generous rating to accelerate rapidly and to withstand overloads. As the average depreciation of belting averages 36 per cent per year, it is important to reduce this waste, and, furthermore, do away with any source of slippage between the driving unit and the working pulley.

Improper mechanical connection between motor and machine, or motor and countershaft, has, in some instances, caused unjust criticism of motor drive. For direct connection a flexible coupling should be used, unless motor and machine are mounted on a common metal bed plate, or the motor is attached to the frame of the machine. Most manufacturers of modern woodworking machines have so designed them that they can be readily adapted to individual motor drive. Chain drive or heavy belt with a spring belt tightener, is desirable when the motor must be located close to the machine, but cannot be direct-connected.

One of the very important, if not an indispensable adjunct to the woodworking plant, is the blower equipment. It consumes from 50 to 60 per cent of the total power used during the month. All intake and discharge pipes must be carefully put together or the efficiency of the blower equipment will be materially reduced, and it will be impossible to operate one intake with all the other intakes closed on less than 40 to 50 per cent of the full-load requirement of the blower equipment.

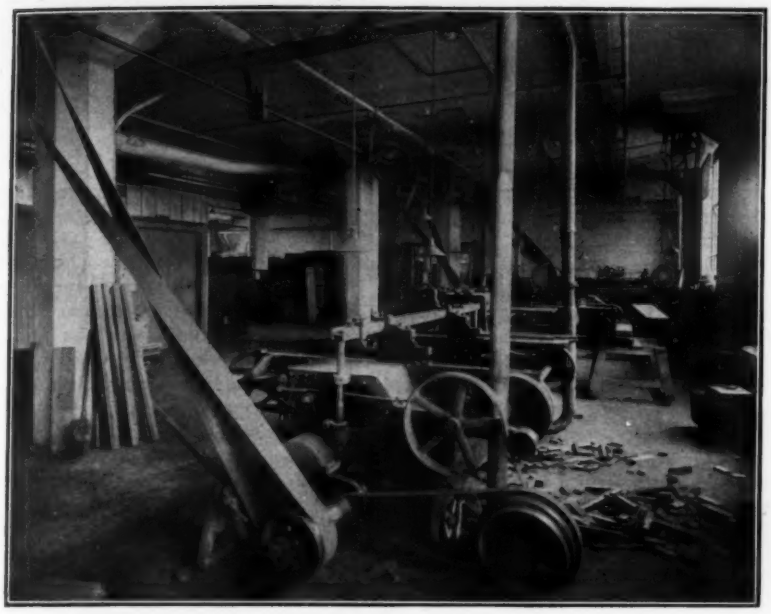
With a well installed blower equipment it is possible to get the "all-gates-shut" current down to 20 per cent of full load. These are found so seldom, however, that a general statement of 40 to 50 per cent would come nearer covering actual working conditions. This is one of the many reasons why the cost of an individual blower system is justified. Practically the same arguments that apply to individual motor drive apply with equal force to individual fan equipment. When, for instance, a planer or matcher, or any particular machine, is not working, its motor and blower are shut down; whereas, with a central blower plant, using perhaps from 40 to 75 horsepower, this equipment must run continuously under a fairly heavy load, even though a very small machine is being operated.

The laws governing the operation of a blower, at least entering into the selection of the motor, are quite complex. There are many variables to be considered. The power required to drive a blower will depend upon: (a) The amount of air to be moved. (b) Veloc-

Group of Small Piano-Making Machines.

HORSEPOWER REQUIREMENTS OF WOODWORKING MACHINES.

KIND OF TOOL	Cubic Inches Material per Second	HORSE-POWER						CUT (Dimensions in Inches)	Feed in F.P.M.
		Mach. Alone	Machine and Work			Work Alone			
			Maximum	Average	Per Cu. In. Mat. per Sec.	Average	Per Cu. In. Mat. per Sec.		
Band Saw, ½"x18" blade	.....	1.0	6.0	3.0	....	2.0	.....	10½"	7.5
Circular Rip Saw, 28" saw	6.73	1.5	24.5	15.5	2.3	14.0	2.1	9½"x¼"	14.2
Circular Rip Saw, 22" saw	5.0	1.5	19.0	10.0	2.0	8.5	1.7	6¾"x¼"	16.1
Rip and Cross-cut saw	2.36	1.5	7.5	7.0	3.0	5.5	2.3	3½"x¼"	18.
Cut-off Saw, 36" saw	5.0	1.5	12.0	10.8	2.16	9.3	1.86	10"x¼"	109
Turning Lathe	.....	0.75	2.5	2.0	.....	1.25	.....		.....
Planer Knife Grinder	.....	0.5	2.4	1.9	.....	1.5	.....		.....
Dimension Planer, 10"x28" (J. A. Fay & Co., Cincinnati, O.	12.8	8.0	19.85	15.65	1.22	7.65	0.60	¼"x14½" Rough Oak	35.3
	19.2	8.0	24.55	20.15	1.05	12.15	0.63	⅛"x14½" Oak	36.3
Moulder	.....	4.1	5.0	4.6	.....	0.5	.....	⅝"x1" to Moulding	12.
	3.47	4.1	7.0	5.8	1.67	1.7	0.49	1¾"x3½" to 1½"x¾"	13.9
Endless Bed Planer	26.0	7.6	19.4	18.2	0.7	10.6	0.41	½"x6½" Y. P.	40.
	35.7	7.6	21.1	18.7	0.52	11.7	0.33	½"x8" Y. P.	40.
	24.0	7.6	30.6	26.0	1.08	18.4	0.77	¼"x12" Y. P.	40.
Flooring Machine (Berry Orton Co. Philadelphia, Pa.	50.0	10.4	33.2	24.5	0.49	14.1	0.28	1⅛"x6" to 1¼"x5½" Y.P.	57.1
	39.8	10.4	22.0	19.3	0.48	8.9	0.22	1¼"x6" to 1¼"x5½" Y.P.	54.5
	26.4	10.4	21.3	19.0	0.72	8.6	0.33	1¼"x6" to 1¼"x5½" Y.P.	54.5
	24.5	10.4	30.5	25.2	1.03	14.8	0.60	2" x8" to 1¾"x7½" Y.P.	42.7
Three Spindle Boring Machine	.....	1.9	7.15	5.9	.....	4.0	.....	Boring freight car end sill	.....
	.....	1.9	7.65	6.5	.....	4.6	.....	Countersinking	.....
Four Spindle Horizontal Boring Machine	8.12	7.15	14.9	12.6	1.55	5.5	0.60	2⅛" hole Oak.	7.5
	7.52	7.15	14.0	12.6	1.67	5.5	0.73	2⅛" hole Oak.	11.25
	2.96	7.15	11.6	10.4	3.50	3.2	1.08	1⅛" hole Oak.	16.7
	4.48	7.15	17.2	12.6	2.81	5.4	1.21	1⅛" hole Oak.	10.
Planing and Siding Machine	30.8	8.0	31.0	29.5	0.96	21.5	0.70	2⅛"x6¾" to 1¾"x5½" Y.P.	44.
	23.5	8.0	33.0	32.0	1.36	24.0	1.02	2⅛"x6" to 1¾"x5½" Oak.	37.5
Surface Planer 24 inch	14.0	2.5	9.5	8.5	0.6	6.0	0.43	¼"x12¼" Rough Y. P.	23.
	18.6	2.5	12.1	11.5	0.6	9.0	0.48	⅜"x12¼" Y. P.	22.3
	34.0	2.5	12.1	12.0	0.35	9.5	0.28	⅜"x19" Poplar.	24.
Planer	25.6	10.0	29.0	24.5	0.96	14.5	0.57	5¼"x10¼" to 5"x10" R. Y.P	33.6
	33.0	10.0	37.5	26.0	0.79	16.0	0.48	8¾"x12½" to 8"x12" R. Oak	20.5
	42.4	10.0	43.0	41.5	0.99	31.5	0.75	11⅛x11¼" to 10¼x10¾"O.	18.75
	48.6	10.0	63.0	50.5	1.03	40.5	0.83	10¾"x10¾" to 9"x10" Oak.	12.
	19.2	10.0	46.5	26.5	1.38	16.5	0.86	8¼"x9¼" to 8"x9" Rg. Oak.	21.8
Daniels Planer	8.44	3.7	10.0	8.75	1.04	5.05	0.59	⅛"x11¼".	20.
Daniels Planer, 25" Head	6.15	1.0	11.0	6.5	1.06	5.5	0.89	⅛"x12½" Ash.	21.4
Straight Moulder	2.51	1.0	5.0	4.0	1.59	3.0	1.10	2¼"x4" Oak.	25.
	7.23	1.0	11.5	8.0	1.10	7.0	0.97	2⅛"x6½" to 1 11/16"x6¼" Y.P.	12.5
Hollow Chisel Mortising Machine	4.43	3.7	14.5	11.9	2.69	8.2	1.85	1¾"x2" Oak.	6.3
Sash Mortising Machine	.....	0.75	1.5	1.4	.....	0.65	.....	¾"x2½" Y. P.	1.67
	0.5	0.75	1.65	1.35	2.70	0.60	1.20	¾"x2" Oak.	.....
End Tenoning Machine	3.99	2.2	11.3	9.10	2.28	6.9	1.73	7"x3" Oak.	.95
Tenoning Machine	3.63	2.2	12.1	8.30	2.29	6.1	1.66	7"x3" Oak.	.86
	1.24	1.9	3.60	3.25	1.59	1.35	0.66	1 11/16"x5¾" to ¼"x5¾"x5¾"	.9
	2.84							1 11/16"x5¾" to ½"x5¾"x4¼"	2.12
Tenoning Machine	1.35	4.9	10.8	5.7	4.22	0.8	0.59	3¼"x6¾"x4" Oak.	.27
Gaining Machine	11.6	2.15	18.1	13.9	1.2	11.7	1.01	2¼"x2"x18" Oak.	12.9
Shaping Machine double head	6.66	2.0	6.15	5.0	0.75	3.0	0.45	2 Saw Cuts 11/64"x ⅛"	18.2
Small Universal Woodworker	.....	0.5	2.01	1.25	.....	0.75	.....	Boring 1" hole. Oak.	.....
Large Universal Woodworker	9.38	1.5	8.4	7.65	0.82	6.15	0.66	3⅛"x1¼" Y. P.	13.3
	14.5	1.5	12.5	9.6	0.66	8.1	0.56	3⅛"x1¾" Y. P.	20.5
	12.8	5.45	10.6	10.35	0.81	4.9	.....	2"x4" to 1 11/16"x3½" Y. P.	30.8
Large Band Saw	0.82	2.50	6.7	5.9	8.5	3.4	4.15	5/64"x12½" Oak.	4.16
Small Band Saw	0.36	2.39	3.5	3.10	8.6	0.71	0.20	5/64"x3¾" Oak.	6.2
	1.27	2.39	6.1	5.3	4.17	3.7	2.96	5/64"x3¾" Oak.	21.7
	1.11	2.39	6.1	5.3	4.77	3.7	3.33	5/64"x5" Oak.	14.3
Cross-cut Saw, 15" saw	1.04	1.1	4.65	4.0	3.84	2.9	2.79	⅛"x4½" Oak.	6.17
Large Cross-cut Saw, 37" saw	.....	6.75	29.7	18.3	.....	11.5	.....	¼"x10½" Oak.	.....
	7.85	6.75	16.5	15.8	2.01	8.0	1.02	¼"x6½" Oak.	24.2
No. 3 Rip Saw, 15" saw, (Berry & Orton Co., Philadelphia, Pa.	5.64	1.75	16.6	16.4	2.91	14.6	2.60	¼"x2½" Oak.	45.
Self-feeding Rip-Saw, 25" saw (Grunlee Bros. & Co., Chicago)	5.25	1.75	19.2	13.9	2.98	13.9	2.64	¼"x2½" Oak.	30.
	4.6	1.75	29.1	18.2	3.96	16.5	3.58	¼"x6½" Oak.	14.
Variety Moulder	4.13	1.5	3.0	2.75	0.67	1.25	0.30	¼"x2" Oak.	41.25
	18.0	4.5	.....	9.7	0.54	5.2	0.29	2⅛"x7¾" to 1 ⅛"x7½" Ash	12.25
Moulder and Jointer	10.9	4.5	.....	9.7	0.89	5.2	0.48	¼"x8¼"	21.
								2"x7¾" to 1⅛"x7¾"	13.3
	9.5	4.5	11.5	9.75	1.26	5.25	0.56	¼"x8¼"	29.8
								2¼"x7¾" to 1 11/16"x7¾"	13.7
								¼"x8¼"	26.3
Rotary Mortising Machine	1.38	2.8	4.8	4.2	3.04	2.0	1.45	1½"x4" Oak.	2.5
	2.19	2.8	5.5	5.0	2.24	2.2	1.00	⅝"x5¾" Gaining Oak.	1.46
	1.64	2.8	6.0	5.5	3.35	2.7	1.65	Countersinking cup washers outside 4⅝"x12". inside 3⅞"x1⅝".	.....
Sash Mortising Machine	0.38	0.5	5.5	4.0	10.05	3.5	9.21	⅝"x2¾".	1.11
Two Spindle Boring and Mortising Machine	1.33	1.5	5.0	4.5	3.38	3.0	2.26	Mortise 1¼"x4".	2.2
	2.41	1.5	3.0	2.1	0.87	0.6	0.25	Boring 1¼" hole Oak.	5.
Five Spindle Boring Machine	4.2	6.0	8.5	7.75	1.36	1.75	0.42	2" hole Oak.	6.66
Three Spindle Boring Machine	3.66	0.45	3.25	2.5	0.69	1.05	0.29	2" hole Oak.	6.87
Three Spindle Boring Machine	1.9	0.7	4.0	3.0	1.58	2.3	1.21	2" hole Oak.	3.
	2.4	0.7	3.2	3.0	1.25	2.3	0.96	1¼" hole Oak.	8.2
Two Side Tenoning Machine	.....	.....	3.0	2.8	.....	.....	.....	2"x8" to ¾"x8".	4.73
	7.8	4.0	11.0	8.5	1.09	4.5	0.58	3¾"x5".	2.1
Large Tenoning Machine	12.5	4.0	9.0	8.5	0.68	4.5	0.36	3¾"x3½".	4.75
	15.9	4.0	13.5	11.5	0.72	7.5	0.47	4¼"x7½".	2.5
	18.7	4.0	13.5	12.0	0.64	8.0	0.43	3¾"x7¾".	3.3
	23.4	4.0	15.25	13.0	0.57	9.0	0.38	3¾"x7½".	4.2
Gainer, 10" Head	9.3	3.0	10.5	8.5	0.92	5.5	0.59	18.7 Square Inch.	2.5
Band Saw, 1¼"x23'-6" blade	.....	1.4	5.4	4.8	.....	3.4	.....	12" Ripping Oak.	4.3
	.....	1.4	6.6	5.4	.....	4.0	.....	10" Cross-Cut.	8.3



Group of Woodworking Machines at Lyon & Healy Piano Factory.

ity of air required. (c) Height to be lifted. (d) Weight of material to be carried off. (e) Speed of the blower. (f) Length of suction. (g) Length of discharge. (h) Resistance of piping. (i) Whether a separater is to be used or not. (j) Number of elbows and turns. (k) Manner of connecting branch pipes into main pipe. (l) Design of hood.

The power required to drive a blower varies as the cube of the speed. If a fan is operating at 1,000 revolutions per minute, requiring one horsepower to drive it, and it is desired to operate the fan at 2,000 revolutions per minute, it being assumed that the general construction will permit, an eight-horsepower motor will be required. The horsepower required also varies with the square of the velocity. If one horsepower is required to give a certain velocity, to double this velocity it will require four horsepower. The power required also varies directly with the volume. If one horsepower gives a certain volume, two horsepower will give double this volume. Blowers for woodworking service are divided into two classes, one for handling short shavings, and the other for long shavings. Both types are built in sizes ranging from 25 to 110 inches, and they increase in size by increments of five inches. The power required to drive these blowers, however, cannot be stated in any simple manner, as all of the variables mentioned heretofore must be taken into consideration.

Data on horsepower requirements of various woodworking machines are given in the accompanying table.

Motor-Driven Veneer Cutter.

Program of Ohio New-Business Convention.

The fifth convention of the Committee on New Business Co-Operation of the Ohio Electric Light Association during the year 1914-1915 will be held at Columbus, O., May 19, with headquarters at the Virginia Hotel. This will be the last meeting of the committee before the annual convention of the association at Cedar Point in July and a large attendance is anticipated. The meetings are open to all interested, not only from Ohio but from neighboring states as well.

The program will open with an address of welcome by Samuel G. McMeen, president of the Columbus Railway, Power & Light Company, and this will be followed by a paper entitled, "Value of Show-Window Advertising," by L. T. Milnor, of the Western Electric Company.

At luncheon A. C. Seymour, of the Columbus Chamber of Commerce, will deliver an address on "Service First."

There will be two papers at the afternoon session, one by H. O. Loebell, of H. L. Doherty & Company, on "Possibilities of Industrial Electric Heating from a Central-Station Viewpoint," and one by V. L. Blanchard, of the Toledo Railways & Light Company, entitled "Electrical Advertising."

Thomas F. Kelly, commercial manager of the Dayton Power & Light Company, is chairman of the Committee.

Philadelphia Company Issues Vehicle Booklet.

The Philadelphia Electric Company has issued to users and prospective users of electric vehicles a handy little booklet containing a fund of useful information. The introduction gives data essential to the proper care of the electric and this is followed with a complete list of charging stations in the city and surrounding country with figures as to the capacity of the various garages and charging stations and the cost of service.

The Philadelphia rules and regulations regarding street traffic are reprinted and a condensed touring map of the surrounding territory is included in the booklet. The map covers a radius of over 300 miles.

Commercial Practice
Management, Rates, New Business

New England Contractors and Central-Station Men Hold Co-Operative Meeting.

An enthusiastic get-together meeting of electrical interests, marking a new era in the relations of central-station men and electrical contractors in New England, was held at the American House, in Boston, Mass., May 6. More than 100 were present.

The meeting was held under the joint auspices of the New England Section, N. E. L. A., and the Massachusetts Electrical Contractors' Association. C. R. Hayes, local manager of the Fitchburg Gas & Electric Light Company, presided.

Mr. Hayes said the relation between the two important branches of the industry is one of the vital issues at the present time. Several months ago the New England Section and the Contractors' Association appointed committees to confer. The central-station men's committee consists of W. L. Milligan, Springfield; F. H. Smith, Worcester; A. C. Gray, L. D. Gibbs, William Gould, Boston; C. R. Hayes, Fitchburg. The contractors' committee are H. A. Holder, Boston; J. T. Coghlin, Worcester; H. F. Haskell, Holyoke; A. E. Truesdell, Pittsfield; H. W. Kimball, Haverhill, and W. K. Tuohey, Springfield.

The committees held a joint meeting on the morning of May 6, when the subject was discussed. A paper on the subject of standardized co-operation was written by L. D. Gibbs, and in his absence was read at the American House gathering by the chairman. Mr. Gibbs said, in part:

"A new point of view has been reached. Up to the present, all the talk and every effort has been to determine what and how the central station could help the contractor. Now the contractors have come to the front in a movement through which the contractors are going to try and find out what they can do to help the central station.

"It seems to me this is the most vital point of view and one that has the most hopeful inspiration in it. Every central-station manager and employee who is successful keeps keyed up to the highest point of sensitiveness in his relations with the public. He makes it a point everywhere to put himself out and to please in every possible way, not only for the sake of the good-will that will be developed, but also for the good-will that will be left behind.

"Every one realizes that 'a pleased customer means ten.' Advertising, circularizing, charity contributions, etc., cannot offset carelessness or neglect on the part of a company's representatives.

"Central-station men cannot be everywhere at once. They cannot put themselves in the place of the contractors. An electrical contractor has a peculiarly intimate relationship with the people who will be, as soon as they pass out of his hands, customers of the lighting company. He and his employees come in contact with great numers of other workmen, with the owners and with the builders.

"Here, then, is the first place where the contractor can co-operate. He should understand the lighting company's methods and be in sympathy with their policies. If he does not hold this sort of relation, his business, so far as helping the central station is concerned, is worse than nothing.

"It stands to reason that he can be in sympathy with the central station if he takes the right point of view. His investments are comparatively small and his risks are not very serious ones. The central station has a large investment, is meeting people not only as individuals but in organizations and in city and town governments, and must adjust its policies not only to please the people but so as to give the best service and get a satisfactory return on the investment.

"It is reasonable, therefore, that the central station should be the guide to determine the policies under which the business should be carried on; but it therefore stands to reason that the contractors, instead of standing back and saying and attempting to dictate, should fall in line and take the first step in standardized co-operation by working along the lines approved by the central station.

"The next important step is not only to agree to this policy and follow it, but talk about it. It cannot be said in the electric light business that 'every knock is a boost,' because the central-station man and people friendly to his interests cannot always be around to explain the various conditions in connection with the knock, and thereby turn it into a boost.

"Every contractor has a large circle of acquaintances, and a field in which his word is taken as authority. Here every contractor should be active to talk in the interest of electricity and of the central-station's policies.

"Third, the committees appointed to work jointly for standardized co-operation might well lay out a scheme for co-operative effort taking one subject each month, and every man agreeing to talk favorably on that subject. The joint committee could send out through the two organizations printed matter explaining the subject under consideration each month, pointing out ways in which it could be brought definitely to the people's minds. This subject could be the consideration of some one policy that is common to all companies, as for example, the requiring of deposits, applications by telephone, the handling of the volume of discontinuances and new connections on May moving day, etc.

Another way to co-operate is by stimulating the sales of appliances. This is a difficult field, because there are so many differing opinions, and such varying financial and business conditions among the contractors.

"Let us all get together and make our co-operation efficient; standardize it, and make it grow."

The chairman pointed out that the interests of the two factors in the industry are mutual, but there are some differences of opinion.

H. A. Holder, a Boston contractor, said new business for the contractor means new business for the station. There ought to be harmony.

H. T. Sands, of C. H. Tenney & Company, said there should be greater co-operation between contractors themselves, and related how in one city served by the Tenney company, the contractors were called together and an equitable division of wiring business proposed, with fair profits based on the contractors' own figures. It required six months to come to an agreement. Mr. Sands realized that competitive conditions exist in the

contracting business such as are not found in that of the lighting companies, but he felt that more unanimity would help the contractors. Great advances have been made in three years toward getting the central station out of the wiring business.

J. T. Coghlin held that the lighting companies should unite on a common policy and then come to the contractors. The latter ought to have more voice than now, as they are the more numerous.

Mr. Hayes said contractors are generally receptive; they wish the central stations to outline the policy. E. P. Rowell, of the Plymouth company, pointed out the varying wage conditions in different localities. In Plymouth the contractors were brought together, with one exception, and agreed on a price for work. A house-wiring campaign was started, the contractors agreeing to take work from the company, which pays the bill, collecting from the customer. The plan is a success.

J. W. Cowles, of the Boston Edison Company, thought the two factors were never far apart, but were now working together as never before. In Boston remarkable results have been achieved by the plan of house wiring that has been in operation some months. Mr. Cowles pointed out the hardship which the various public service companies undergo in the fact that moving day—May 1—involves a vast amount of installation and reconnecting work. On that day, in Boston, 600 orders were received of which about 50 per cent were "move" orders, and many of the Edison company's men worked until 10 p. m., though the day this year came on a Saturday half-holiday. Boston real estate interests should be prevailed upon to diversify the date of lease terminations, etc., as has been done with some effect in Chicago.

W. K. Tuohey, a Springfield contractor, congratulated the company on the fact that the two once hostile elements were sufficiently reconciled to get together. He objected to Mr. Gibbs' view as to the central station laying down the policy for contractors to follow. This, he said, is not co-operation at all. The electrical contractors' organizations aim to make contractors prosperous enough to help the lighting companies as independent factors. Central-station interests should promote this end. Conferences will help solve the problems of how to handle business.

W. E. Clark, of the Clark & Mills Company, Boston, was glad to note that, generally, cut-price appliance sales had been done away with. He held that special introduction sales were justifiable, the central station thereby making a luxury become a public necessity, but once the appliance is introduced the central station should give up its sale. The lighting company should look upon the contractor as its high-class, unpaid solicitor. Mr. Mills held that no profit could be made on Edison company house-wiring contracts under $75 in value, except perhaps by small contractors with low overhead expense.

H. G. Lendrim, Providence, R. I., said contractors could not agree on price per hour any more readily than central stations could arrive at a standard price per kilowatt-hour for all communities. Let a central station's unit price to contractors, in house-wiring campaigns, be based on the highest rather than the average rate, and allow the smaller men a clear margin of profit, he urged. He approved of the Narragansett Company's policy of retailing appliances and tungsten lamps at list price, and pointed out that contractors can likewise sell at list and make a fair profit. He reported the failure of a licensing bill to pass the Rhode Island Legislature, but predicted that another year would see one enacted.

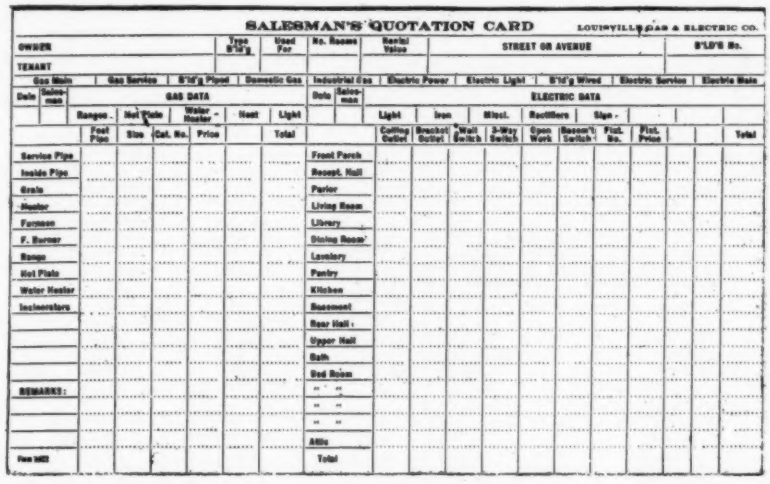
M. R. Griffeth, of the General Electric Company, and familiar with the Maine territory, alluded to the success of a house-wiring campaign now on in Portland. In November last all the city contractors agreed on a price for their work, and since then more than 600 houses have been wired. In the Maine town of Sanford 116 houses were wired in six weeks, and the contractors in both places are satisfied with the arrangement, and making money. The lighting company will receive its pay in 12 installments, covering a year.

Card Index Increases Efficiency of New-Business Department.

A new card-index system is being made up and put to use by the Louisville Gas & Electric Company which, when finished, will contain, in compact and ready form, a complete description of all electrical and gas installations, and as time passes this index will constitute a detailed history of all these installations, the records covering the whole territory served by this company. Every establishment will be represented in the index by a card. Arrangement will be alphabetical or numerical, lettered or named streets being filed alphabetically and numbered streets filed in their proper rotation, special dividing cards indicating the beginning of each section.

The advantages of such a record and history are self-evident, and attempts are generally made by all utility companies to keep something of the kind. The system the Louisville company is installing, however, appears to meet every test in a most satisfactory way, and promises to be of great and increasing value to the company. It has been perfected by Robert Montgomery, manager of the commercial department, and combines available good points in other card-index systems.

Beginning with A Street and ending with Zimlich Lane, with the numbered streets running from First to Forty-seventh, there will be some 50,000 cards, and each will contain, in the order in which the buildings they account for are numbered on the streets, a reference to the ledger account, description of the building, purpose for which used, number of rooms, estimated or actual rental value and the street and number. The date, term of lease or occupancy, name of occupant and description of installation will be indicated in places provided for on the body of the card. Each card


SALESMAN'S QUOTATION CARD

LOUISVILLE GAS & ELECTRIC CO.

OWNER | Type | Used For | No. Rooms | Rental Value | STREET OR AVENUE | B'LD'G No.

TENANT

Gas Main | Gas Service | B'ld'g Piped | Domestic Gas | Industrial Gas | Electric Power | Electric Light | B'ld'g Wired | Electric Service | Electric Main

GAS DATA — Date | Salesman | Ranges | Hot Plate | Water Heater | Heat | Light

	Feet Pipe	Size	Cat. No.	Price			Total
Service Pipe							
Inside Pipe							
Grate							
Heater							
Furnace							
F. Burner							
Range							
Hot Plate							
Water Heater							
Incinerators							
REMARKS:							
Fee Bill							

ELECTRIC DATA — Date | Salesman | Light | Iron | Miscl. | Rectifiers | Sign

	Ceiling Outlet	Bracket Outlet	Wall Switch	3-Way Switch	Open Work	Recess'd Switch	Fixt. No.	Fixt. Price			Total
Front Porch											
Recept. Hall											
Parlor											
Living Room											
Library											
Dining Room											
Lavatory											
Pantry											
Kitchen											
Basement											
Rear Hall											
Upper Hall											
Bath											
Bed Room											
" "											
" "											
" "											
Attic											
Total											

Card Used in New-Business Survey.

contains space for 14 names, enough to provide for a considerable number of changes of occupants of any one building.

As shown in the illustration the card is divided into spaces for much detailed information. In dimensions, each is five by eight inches, of a good quality of bristol board. At the top of the card are ten tabs, five applying to gas service and the remainder to the electrical division of the business. As will be seen, they provide for classification of all patrons into divisions as indicated, and it is in these tabs that a great deal of the value of the system lies. They, of course, are the keys to the situation.

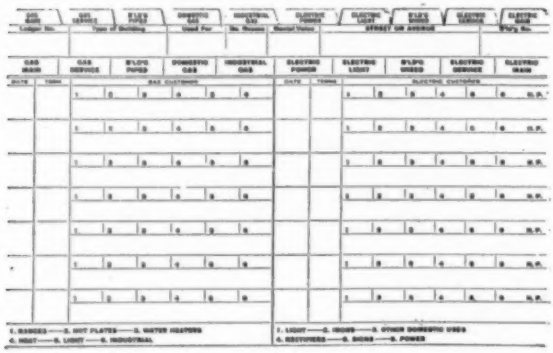
It will be noted that the tabs progress as to gas from left to right, and as to electricity from right to left. This is to facilitate clipping with scissors from the edges inward. First of all, of course, the patron, or the possible patron, must be located on a service main. The rows of cards in the cabinets at the Louisville Gas & Electric Company headquarters show at a glance that there are few of such mains yet to be constructed. So these tabs come off. If the service connections are made, the next tabs are clipped. If the building described is piped or wired these tabs come off, accordingly. If the card happens to relate to a manufacturing plant, which can hardly use gas for domestic purposes, that tab comes off. From the electrical standpoint the treatment is similar.

All this spells prospects. The commercial manager who has a salesman to put to work, goes to the cabinet and takes out the section with the Broadway cards, for example. The outside tabs are gone, which means that the street is on a main. Here and there are cards which have all the rest of the tabs on the electric side of the card on them. These must be old houses which have never been wired for electricity. The salesman makes his list and fares forth with definite information as to every house on which he will call. The patrons, or rather the buildings of the city, are classified according to what they lack in regard to service rather than according to what they have. In other words, every tab that sticks up is a challenge, and the object of the whole commercial department is to clip it off. As long as a single tab rises above the general level of the cards this means that there is new business to be obtained.

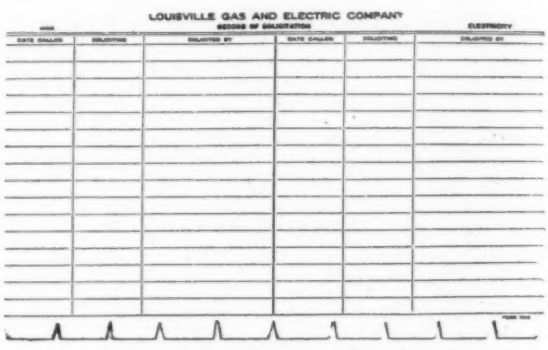
For purposes of convenience, the territory of the company is divided into five sections, with a salesman assigned to each. These men have been charged with the responsibility of making up the original cards, and it will be up to these men to keep them up to date. From data in the books of the company or from data obtained by house-to-house canvassing, these district men fill out the cards and clip tabs accordingly. The spaces at the top immediately under the tabs are filled in, and the name of the occupant listed in the first name space below. The character and extent of his installations is shown by checks in the spaces over his name, or on the electric side in the spaces on the same level. When the first column fills up, as it may in time, cross checks will indicate the extent of the installations of later occupants.

Suppose the tabs indicate that the house is without electric wiring. The salesman makes up his list of calls, takes notes on the results of each call, and then on the back of each card notes that on such and such a date he solicited the house described. In addition he fills out a "Salesman's Quotation Card" in a detailed manner, showing when he called, on whom he called and the prices he quoted on each item. Any remarks that need to be made are noted on the back of each of these salesmen's cards. These cards, in turn, are filed just behind the house described on the principal or "master" cards, being half an inch less in length and about a quarter of an inch less in height. Then, when the prospect, or a new occupant comes to the offices of the company or calls for an estimate of any sort of installation, it is not necessary to send a man and duplicate the estimate and requote. All that is necessary is to refer to the quotation card and give the answer.

Once the card-index system is completed, it will be kept up with comparative ease. The cabinet is stationed in the commercial department, through which everything in the way of new business passes, and by which every new installation will be checked on the card records. Reports of every building permit come to the office, as do reports of all electrical permits. Representatives of the company make the runs and report on every fire. The meter men report on every change of occupancy, and the district men patrol their sections and ascertain when any newcomers take up their abodes therein, the company getting besides the reports from the police department of every removal. It is readily possible for the district men to ascertain what the new occupants of any house are making use of in the way of appliances, and the new entries, date, term of lease, etc., are described accordingly.



Reference Cards for New-Business Department.



Reverse Side of Card.

It is never necessary for new classifications to be made for any house, it having been the experience of the Louisville Gas & Electric Company that new tenants are certainly going to make use of whatever accommodations a house they occupy affords. A house once on a main will always be on a main, a house wired for electricity will always be wired and the new tenant will surely burn electric lights, while anybody who comes into a house piped for gas can be depended upon to make some use of it. At least, the exceptions to the rule will be very few and the monthly bills will furnish a clew which will sooner or later lead to investigation of the situation.

Another interesting feature is the fact that Mr. Montgomery is using red cards to indicate the houses which have rental values of more than $40 a month. Prospects again. Presumably people who can afford to pay that much rent can afford to invest in electrical appliances of more or less elaborate nature. The appliance dealer who finds business getting dull, and who wants to stir things up a bit, need only send a man over to the offices of the company to run through the index. Taking one red card after another and examining them for what they show, a list of prospects can be made up.

Electrical Construction

WIPING A LEAD-COVERED CABLE.

By H. E. Weightman.

The following tools are generally used in making lead-covered-cable joints: a gasoline furnace and solder pot in which to melt the solder and an iron ladle to mix and pour it; a shaving hook such as shown in Fig. 1, to scrape or shave the surface of the lead where the joint is to be made; a mallet or hammer; and a pad to hold in the lower hand under the joint. This pad may be made of four or five thicknesses of ticking, about four inches square, one surface of the pad being rubbed with tallow, or with

Fig. 1.

chalk and tallow, to prevent melted solder from sticking to it. A small hand glass or mirror is useful for examining the under side of the joint.

The following materials will also be required: lead pipe sleeves, wiping solder, paper pasters, and tallow candle. For wiping solder one large company specifies a 40-60 lead solder, and in place of mutton tallow, which is often used as a flux, stearic-acid candles. However, half-and-half solder is more generally specified. Another material required is gummed paper, frequently called paper pasters, 2.5 inches wide, or plumbers' soil or plumbers' paste. A piece of chalk is also a convenience. All these things—except, perhaps, the gummed paper—may be obtained from a plumbing supply house. The gummed paper comes in rolls and may be obtained at any printing shop.

Plumbers' soil is made by dissolving two tablespoonfuls of glue in one quart of boiling water or stale beer. Beat into the mixture one pound of lamp black and a tablespoonful of powdered chalk. Heat the soil each time it is used. Plumbers' paste is made by mixing flour and water quite thin, beating out all the lumps. By adding a little pulverized alum, the paste may be preserved a month or more. Thicken by heating it slowly over a fire.

In splicing, the lead sleeve should overlap the cable at least 1.5 inches. The sleeve having been moved in place, the ends should be dressed down with a mallet, that is, hammered down so as to make a tight fit to the sheath.

Instead of plumbers' soil or paste, as used by most plumbers in a manner that will be explained, most cable splicers now use paper pasters, first scraping with the shaving hook the portion where the joint is to be made and placing one strip of gummed paper around the sheath and another piece around the sleeve, leaving the lead exposed for a distance of about 1.5 inches on each side of the joint, or a distance of about 3 inches between the adjacent edges of the paper pasters, as shown at the left end in Fig. 2. This brightened and exposed lead should be covered with candle grease or tallow to prevent it from oxidizing. Do this at one joint only, leaving the other joint until ready to wipe it.

Plumbers generally cover the joint for a distance of about 3 or 4 inches on each side of where the sleeve and sheath come together, first with chalk to counteract grease that may be present, then with plumbers' soil or plumbers' paste. After this is dry, make marks around the cable sheath and sleeve at a distance of 1.5 to 2 inches on each side of the joint, using for this purpose the point of the shaving hook. With the shaving hook shave or scrape the lead bright and clean

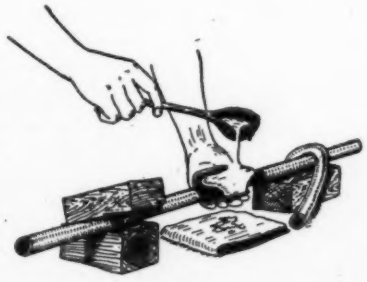


Fig. 3.

for a distance of 1.5 inches on each side of the joint, as indicated in Fig. 2, immediately covering the bright portion with tallow or candle grease.

It is very important to fix the joint firmly in some position so that the parts cannot move while the joint is being wiped. There should always be allowed a space of 4 inches around a joint in any case, so that the workman can do a good job.

Melt the necessary amount of solder, which will depend upon the size of the cable, in the pot and heat it to the proper temperature. The solder should not be any hotter than really necessary to make it flow. It should not be hot enough when in the pot to ignite a pine stick when thrust into it, or just hot enough to char paper when thrust into it. When wiping a joint care must be taken not to have the solder too hot, or to pour too much of it at one place, otherwise there is danger of melting the lead sheath. Place a clean paper, board or

Fig. 2.

pan under the joint to catch and keep clean whatever solder may fall on it.

Warm the wiping cloth until it becomes pliable, and hold it in the left hand, steadying it with the thumb. The cloth should form a hollow, resembling a saucer, so that it will receive and retain the solder that falls from the joint, in order to heat the under side of the joint. The solder should be thoroughly stirred with the ladle so as to mix the ingredients, tin and lead, together. The first object in making a joint is to tin the entire portion that has been scraped bright and covered with tallow, and the second object is to get on enough solder to make a tight and strong joint.

The solder is then slowly poured over the joint, the surplus solder being caught in the cloth under the joint, as shown in Fig. 3, taking care to heat the parts uniformly all around. When a quantity of solder has been caught in the cloth, it should be worked around onto the top, then more solder poured on this, the surplus being caught in the cloth, as before, heating the under side of the joint with it and again working it to the top of the joint. When the solder on the joint has become so hot as to be plastic, and is inclined to slide or drop off, and if it is certain that the surfaces are

thoroughly tinned, and that the sleeve and sheath are sufficiently hot to maintain the solder in a plastic condition long enough to perform the necessary work, and also that there is enough plastic solder to make a good joint, pouring should be stopped and the wiping begun. The colder pieces of solder that have set, or are beginning to set, are first thrown off the joint with the cloth, then the edges of the cleaned or shaved parts are located, and the solder is formed into the shape desired, as shown finished at the right end, Fig. 2, by hollowing the cloth for that purpose.

At the time of forming the joint, all the superfluous solder should be thrown off. The joint should then be finished by working the cloth around from bottom to top, on both sides, and finally drawing the cloth lightly across the top.

This movement frequently leaves some solder projecting over the paper pasters or soiling. This should be broken off as soon as it forms, by lifting it with a knife blade. The hand glass may be used to see whether the under side of the joint is properly made. When the joint is made, it is well to spray a little water over it, or to fan it, in order to make it set rapidly, thus preventing the separation of the tin and lead in the solder, which may happen if it cools too slowly.

To wipe a joint on an upright cable, secure the parts firmly in position, apply the plumbers' soil, paste, or gummed paper and shave the joint and put on tallow as previously explained. A collar should then be attached temporarily to the cable directly under the joint, so as to catch the solder and raise the temperature of that part of the sheath. In Fig. 4 is shown a piece of lead cable with a collar in position, the collar being supported by a cord tied around the cable. The collar should be cut to a pattern as shown, so that when it is formed around the sheath, the points can be doubled over and locked together, so as to prevent its falling apart when solder falls in it. These collars are best made of sheet lead, as this metal is very pliable and free from spring. The inner surface of the collar should be coated with soil or paste, each time it is used, to prevent solder from adhering to it. Paper collars are sometimes used, but for heavy cable work are not satisfactory. The heat may be applied to the joint by a gasoline torch. The solder is splashed on the joint from a ladle, using if necessary or convenient a flattened stick for this purpose. It is splashed on gently and in small quantities at first to avoid burning a hole in the sheath. The speed and quantity is increased, however, until a body of solder is piled up against the scraped portion of the joint. The splashing is continued, or metal may now be thrown on the joint from the ladle directly, until the joint is thoroughly and uniformly heated and the mass of solder is so soft that it cannot stay up, but slides down into the collar. As the sheath conducts the heat away, it is necessary to lift the plastic solder to the top of the joint, which cools first, in order to keep that part hot. When the solder persists in sliding down into the collar and when there is considerable more solder than necessary to finish the joint, the wiping cloth is used to wipe the solder into proper form.

When a wiped joint is to be made between a lead cable and a brass or iron sleeve or conduit, it is necessary to first tin the brass or iron sleeve thoroughly. To do this, the sleeve must be scraped clean and bright and resin or soldering fluid used as a flux to make the solder adhere to the brass or iron. The use of soldering fluid, such as zinc dissolved in hydrochloric acid, enables brass, and especially iron,

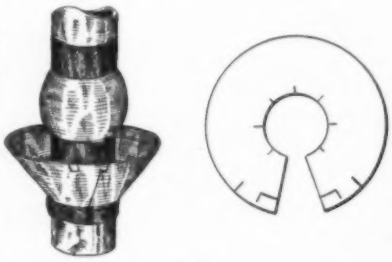


Fig. 4.

to be more easily tinned, but the latter is very corrosive and must be thoroughly wiped off, both outside and inside the sleeve, before the cable is brought near it. With patience, either brass or iron can be tinned, using resin or some other non-corrosive soldering preparation as a flux, and by its use there is no danger of injuring the conductors or the insulation. A tight fit should be made between the lead sheath of the cable and the brass or iron sleeve; in most cases, the lead sheath can be inserted 0.25 inch or more inside the brass or iron pipe. The lead sheath is then prepared for a joint, which may be made in the usual manner.

If it can be avoided, a cable should never be opened during rainy or foggy weather. If a cable must be opened during wet weather, the cable ends should be thoroughly protected by means of canvas sheets. If caught in a shower while making a splice, great care must be taken to protect the cable ends from moisture by thoroughly soaking them in hot insulating compound and wrapping them in canvas.

In all cases where the end of a cable is left unconnected for a considerable time, the lead sheath should be sealed with a wiped joint and cap.

The sleeve is generally filled by pouring hot insulating compound through two holes cut in the lead sleeve for this purpose. These holes are made about one-third the distance from the ends and the hot insulation is formed into them alternately until the sleeve is filled. Sufficient time should be given the compound to permeate the cable and drive off any moisture that may be present. The expulsion of all moisture is important. Should there be any indication of moisture in the joint when the insulating compound is being formed into the sleeve, one end should be elevated, in order that, as the compound is being poured into one hole, it will run out at the other, carrying with it all the moisture. The amount of overflow should at least be equal to that required to fill the sleeve. This overflow should be caught and used again. When the joint is filled the holes are closed by carefully soldering sheet-lead caps over them.

Quick Motor Repairs.

Pitting of the micanite insulation between the segments of commutators leads to all sorts of commutator troubles.

The better the insulating material the less danger of pitting. However, the best micanite will pit to some extent. This results in a flash over and a burnt-out armature coil or other commutator trouble. To overcome this I use a paste, which is made up of powdered mica, plaster of paris and orange shellac, mixed together in the form of an easy working paste.

To apply this, first scrape clean all burnt insulation. Scrape until you see clean mica. Press into all crevices thoroughly, without entrapping air into the crevices. Allow the work to stand for a short time, then scrape with sandpaper, until the commutator is smooth, and the machine is ready to start at once.

The drier this paste is, the better the insulation, so to be sure of a good job, bake or heat with a torch until dry.

This paste will keep a motor or generator running as long as there are no burnt-out wires, and will save coils from being burnt out.

The best tool for cleaning out the burnt micanite is made by grinding a broken hacksaw to about the proper thickness of the insulation.

Frederick A. Grohsmeyer.

Forty-eight 36-inch searchlights are used in the spectacular lighting of the Panama-Pacific International Exposition.

A Contractor's Carnival Exhibit.

The accompanying illustration shows the booth of the A. B. Hains Electric Company at the carnival recently given by the ladies of the Episcopal Church in Gary Ind. This affair continued for three days, and about 25 of Gary's leading merchants were represented. This carnival was held on the second floor of the Hodges & Ridgely Building which has about 8,000 square feet of floor space.

The orders taken at this carnival were very satisfactory. Different electrical articles were demonstrated to people whom the firm had never been able to reach before, and they feel that this is one of the best ways to get different articles before the public.

The new El-Grilstovo, manufactured by the Hotpoint Electric Heating Company, was on display, and orders were taken for a number of them.

The company also had the lighting privilege for the entire hall, and installed 12 different styles of lighting fixtures, these fixtures being furnished for this purpose by the Holophane Company and the Frank Adam Electric Company. On each fixture there was a card stating the purpose for which it was used, size of lamp, etc.

The labor and expense of this affair was a small item in comparison with the good advertising obtained from it.

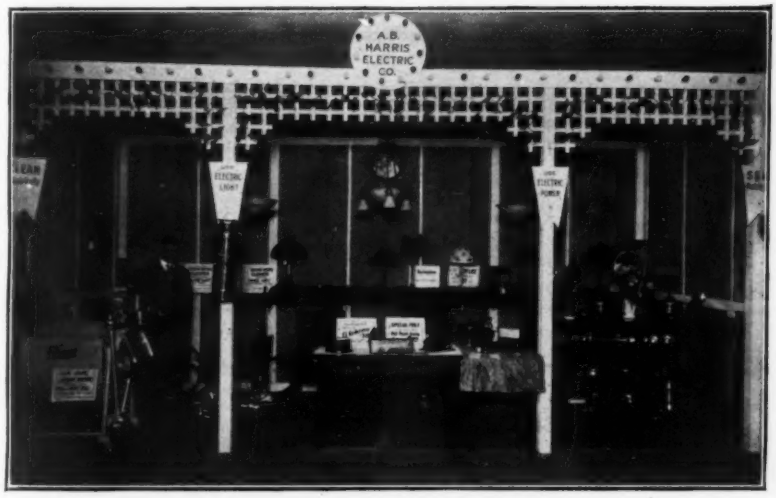


Exhibit of A. B. Harris Electric Company.

Fan Searchlight Provides Novel Window Display.

An enterprising electrical dealer in Ohio has adopted the following method of calling attention to his show windows after nightfall, which was recently described in the *Emerson Monthly*.

A pair of Emerson oscillating fans are placed in the window, each equipped with a 100-watt Mazda lamp and reflector mounted on the front of the guard in such a manner as to throw the light in the same direction as the breeze. The flexible cord connecting the lamp socket to the receptacle is fastened carefully to the guard, out of the way of the blades, and to the motor base, to minimize the strain of bending with each oscillation of the fan.

After the windows have been darkened to some extent, the fans are started up and the fan lights are turned on. The result is sure to attract attention, even from across the street.

Battery Bell Signaling in English Mines.

The English Home Office has issued a report by R. V. Wheeler, of the Home Office Experimental Station, Eskmeals, on battery-bell signaling systems, as regards the danger of ignition of fire-damp-air mixtures by the break flash at the signal wires. The experiment undertaken, following upon the Senghenydd colliery disaster of October, 1913, have formed the subject of a previous report. Those experiments were made with a view to determining the limiting conditions under which the electrical ignition of fire-damp-air mixtures could be effected when using a battery of dry cells connected through a bell of the pattern used at the colliery at the time of the explosion, so as to form a signaling circuit. The present further experiments were made to obtain a system of bare-wire signaling which would be free from the danger of ignition of fire-damp-air mixtures by the flash produced on breaking circuit at the signal wires. That object, it is reported, has been obtained, inasmuch as it has been found possible to determine, with considerable accuracy, the limits of current, voltage, and self-inductance of an electric circuit, derived from primary batteries, that can cause ignition of the most sensitive fire-damp-air mixture by the flash obtained on breaking the circuit; and at the same time it has been found possible to construct a bell which, while conforming with the requirements of safety as indicated by these limits, gives an adequate signal. The report details fully experiments made upon a number of bells and the conclusions reached respecting battery-bell systems are as follows:

(1) All the bells examined were capable of producing a highly dangerous break-flash at the signal wires when used with a battery of ten wet Leclanché cells, the voltage being 15. The break-flash was still more dangerous when a battery of ten dry cells was employed, since the current available from them is considerably greater than that obtainable from wet Leclanché cells. In general the bells examined were "overpowered." A single bobbin with a reduced number of layers of wire was found in several cases, when fitted to the original bell-frame, to actuate the bell as efficiently as is required in practice. The use of only one bobbin (i. e., a bar electromagnet) with a small number of layers of winding reduces the self induction of the circuit and thereby decreases the danger of the break-flash at the signal wires.

(2) Inasmuch as the voltage is relatively of little importance compared with the current strength, so far as the safety of the break-flash on the signal wires is concerned, it is desirable that attention should be directed towards not exceeding a certain maximum number of cells in the battery, rather than that care should be taken not to exceed a certain voltage. Moreover, it is desirable that a cell of comparatively high internal resistance, such as the wet Leclanché cell, should be employed, so as to avoid the possibility of obtaining large currents on short-circuiting the battery.

(3) Taking as a standard battery ten wet Leclanché cells, quart size, such as are commonly used for battery bell signaling systems, giving a voltage of 15 and a maximum current on short-circuiting of about 1.5 amperes, it is possible so to modify the usual pattern of bell as to render the break-flash at the signal-wires safe in the most sensitive methane-air mixture, without impairing the ringing power of the bell. This can be done in several ways, of which, Dr. Wheeler says the simplest probably are:

(*a*) By the introduction of a non-inductively wound resistance coil in series with the magnetic coils such that it will reduce the current available at the break-flash below the minimum igniting current.

(*b*) By increasing the resitsance of the magnet windings of the bell by the use of wire of fairly high resistance, such as brass wire, for the same purpose as in (a).

(*c*) By the use of parallel winding.

(*d*) By the use of tinfoil strips between the layers of winding.

Of these four methods the third may be open to the objection that should the short-circuited winding be accidentally broken the bell might become unsafe.

The mixtures of fire-damp and air most sensitive to ignition by the electric spark are those containing between 7.3 and 9.4 per cent of methane. The limits of inflammability under the conditions of the experiments are 5.6 (lower) and 14.8 per cent (higher). Dr. Wheeler says that the danger from electrical bells of the kind largely in use in English mines is from self induction due to the unnecessarily large number of coils of wire on the bell magnets.

An investigation is now in progress of other systems of signaling, including relay and alternate-current signaling.

Fred G. Dustin Enters Contracting Field.

The electrical contracting fraternity of Minneapolis, Minn., has recently received an enterprising coworker in the person of Fred G. Dustin, one of the best known electrical men in the Northwest. In the latter part of March the Standard Electric Company was organized by Mr. Dustin and Charles W. Arrick, both recently of the Northern Electrical Company, of Minneapolis. The Standard Electric Company was launched by its two joint proprietors to engage in general electrical contracting business. Although in existence but a little over thirty days, the new company reports that a very satisfactory volume of business has already been executed. The excellent prospects of this firm being due largely to the personality of Mr. Dustin, make a brief review of his interesting career very timely.

Fred G. Dustin has been prominently identified in electrical industry for the past eighteen years, both locally and throughout the country. He was born in Minneapolis on August 12, 1872. He attended the Minneapolis schools, graduating from the South High in 1892; he then entered the University of Minnesota and graduated from its College of Electrical Engineering in the class of '96. After some years' experience in electrical contracting and telephone engineering, Mr. Dustin accepted a position with the city of Minneapolis as chief electrical inspector, which position he held for twelve consecutive years, resigning in May, 1912, to become manager of the Northern Electrical Company, of Minneapolis.

Mr. Dustin has gained high distinction in the electrical field as an authority on electricity, and has taken a prominent and active part in civic as well as electrical matters. He is a past president of the Western Association of Electrical Inspectors, former treasurer of the State Board of Electricity, former secretary of the Minnesota Section of the American Institute of Electrical Engineers, an honorary member of the National Association of Stationary Engineers, founder and past president of the Minneapolis Electric Club, member of the Saint Anthony Commercial Club, and of the Civic and Commerce Association, also vice-president of the Prospect Park Improvement Association and several other organizations. Mr. Dustin is a Mason, being past master of his Masonic Lodge, Hennepin No. 4, and member of Ark Chapter No. 53. He was secretary-treasurer of the local committee which entertained the national delegates of the Western Association of Electrical Inspectors in Minneapolis last January. He is also a very active member of the Jovian Order.

Mr. Dustin is a believer in doing

Fred G. Dustin.

things for the betterment of all concerned in the electrical field, contributing valuable information to electrical publications that prove of great benefit to young men seeking advancement. He was for seven years in charge of the Electrical Department of the Y. M. C. A., where he proved instrumental in assisting many young men to better positions in their electrical work. In all these activities Mr. Dustin has naturally greatly extended his acquaintanceship both locally and nationally and is probably today one of the best known men in his profession.

Practical Fixture Suggestions.

The electric fixture man is sometimes confronted with the proposition of lighting two adjoining rooms to get a harmonious effect, yet avoid similarity, thus by using a semi-indirect bowl in one room and shades to match on a shower in the next room, it makes too great a contrast between the two, owing to the very light ceiling from the semi-indirect bowl and the comparatively dark ceiling in the room where the shower is used. To overcome this it is suggested to use a 3.25-inch holder on the shower and use squat balls of the same pattern as the semi-indirect bowl. This causes considerable light to be refracted through the upper half of the ball to the ceiling and by hanging the sockets fairly high it will give a very pleasing effect. The balls entirely inclose the lamp, thereby avoiding all glare, and also give a better diffusion of the light rays than open-bottom shades, since with the use of such shades comparatively little light is directed toward the ceiling.

It is now possible to procure practically all standard makes of glassware in suitable shapes to fit out a job throughout with one design so that a pleasing and finished effect is now readily obtainable as suggested above.

E. M. Raetz.

Among the Contractors.

The F. M. Grant Electric Company, Cleveland, O., has recently secured the following electrical contracts: a complete lighting system in galvanized iron conduit in an eight-story cold-storage plant; a conduit installation for both light and power in an extensive two-story metal-stamping factory; a conduit installation and fixtures for the loading platforms of a large automobile factory; a complete galvanized-iron conduit system, with several hundred galvanized condulet fittings for both light and power on the United States training ship *Dorothea*, which was formerly wired in wood molding. Every foot of molding is to be removed and a complete iron conduit system is to be installed from stem to stern and from keel to top mast under rigid government specifications. In addition to the above, the same firm has the contracts for a four-story addition to a fireproof office building, several large residences and a large one-story addition to a factory.

The Home Electric Construction Company, Macomb, Ill., has been awarded the electric work for the new high school buildings at Rushville, Lincoln, and Lewistown, Ill.

Olson Brothers Electric Company, St. Paul, Minn., is wiring the high school at Morris, Minn. The firm has recently completed the wiring of the cold-storage plant at the University of Minnesota, two buildings at the State Insane Asylum at Hastings, the high school at Montevideo, and the chemistry building of the University of South Dakota, at Vermillion, S. D.

The vessels of the United States Lighthouse Service are being equipped with radiotelegraph apparatus.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The San Joaquin Light and Power Company is authorized to issue $1,582,000 of series "C" six-per-cent, 40-year, first and refunding mortgage gold bonds. The company may also issue interest coupons calling for one per cent per annum additional interest to any holders of the $2,294,000 of series "B" five-per-cent bonds now outstanding, who will pay a premium of $100 upon each $1,000 bond held by them. Of the new series "C" bonds $1,532,000 are to be issued in lieu of a like amount of series "B" bonds, now held in the company's treasury or pledged as collateral. The order provides that the series "C" bonds shall be sold at such a price that the first $300,000 of the bonds shall yield not less than 94 and accrued interest, and the remainder not less than 95 and accrued interest. The proceeds derived by the company from the sale of the bonds authorized and from the premiums obtained by exchanging series "C" for series "B" bonds will be used in retiring $954,000 of two-year callateral trust notes, maturing August 1, 1915, and in paying outstanding notes representing funds borrowed for capital expenditures in the sum of $838,300.

The Commission states that it is not greatly impressed that the substitution of six-per-cent for five-per-cent bonds will work to the company's ultimate advantage, on account of the greater expense entailed in the assumption of a higher bond-interest rate, although it finds that the curtailment of salaries to two executive officers, by which the company saves $12,000 per annum, will more than offset the extra cost of this substitution.

The Commission further finds that the financial plan proposed by the company is not in full accordance with the Commission's decision of a year ago, when it declared that there was obviously a very large discrepancy between the value of property and the amount of stock and bonds outstanding. The Commission, therefore, recommends that the company submit within 90 days a plan for future supplemental financing which will show how it proposes to secure funds to defray costs of extensions, betterments and additions other than from the sale of bonds.

ILLINOIS.

Commissioners Confirmed. The appointment of William L. O'Connell to succeed James E. Quan, who has served as chairman of the Commission from its organization until last March, was confirmed by the Senate on May 5. The other members are Frank H. Funk, Richard Yates, Owen P. Thompson and Walter A. Shaw. These men were appointed by the governor after the adjournment of the legislature two years ago, and their appointments were also confirmed by the Senate at this time.

MASSACHUSETTS.

Rowley Petition. The municipal light board of the town of Rowley petitioned the Board to consent to the establishment of a price for electricity, alleged to be less than cost. The electric energy is purchased from the Ipswich municipal plant at six cents per kilowatt-hour. The town expects to secure a more favorable rate, especially if there is an increase in the amount purchased. The town of Rowley proposes to reduce its rate from 15 cents to 12.5 cents per kilowatt-hour. The manager of the plant believes that an increase in consumption will be stimulated by a lower price. The price proposed is admittedly less than cost, as defined by the statute.

Under the Massachusetts statute the authority to establish the price at which electricity shall be sold by municipal plants to private customers rests with the manager of the plant, acting under the direction of the municipal light board, subject, however, to the provision that the price shall not be less than cost, except with the written consent of the Board of Gas and Electric Light Commissioners.

The Board says: "The evident purpose of this provision is to guard the taxpayers, on the one hand, from being charged too high rates for the benefit of the consumers. In applying the statutory requirements the Legislature apparently intended by the term 'cost' the average cost computed upon the total units or kilowatt-hours delivered for all uses, not only to private customers, but to municipal buildings and to the street lamps. As the Board has had occasion to point out before, the method of determining 'cost' prescribed is somewhat arbitrary and artificial, and gives little consideration to the assumption of such risks as may be reasonably necessary to develop the business. It is obvious that an increase in output which involves no corresponding increase in investment may be closely related to the price at which the electricity is offered. Such considerations were doubtless recognized by the Legislature when it permitted the rule to be relaxed with the consent of this Board. In administering this provision of the law, while the Board is convinced that it would be unsound and unwise for the town to adopt a policy of selling electricity permanently at a loss, yet it is not disposed to withhold its consent from the taking by the management of what seems no more than a reasonable business risk. The new price must, of course, be regarded as experimental, to be abandoned later if a reasonable experience under it demonstrates that electricity will thereby be sold at a loss."

In this case a question aros over the payment for electricity supplied by the plant to the municipal buildings. The Board finds that the delivery of electricity by the municipal plant to the buildings is not a sale for which the statute requires a price to be fixed, but says that "the importance of a definite charge for the service rendered by the plant to the different departments having the custody of the buildings is obvious, not only for convenience in accounting, but as an aid to the proper administration of the town's affairs. It must be equally obvious that unless the cost of the electricity used in the buildings is provided in the appropriations for their maintenance it must be taken care of in the appropriation for the lighting plant."

MISSOURI.

Joplin Water Works Company. In two recent decisions involving the Joplin Water Works Company, the Commission has passed upon regulations affecting rates which are of interest to electric plants.

The city of Joplin objected to a reconnection charge imposed by the company. The Commission says: "A similar rule, to which objection is here made, was allowed by the Commission in the case of Cole v. Ft. Scott & Nevada Light, etc., Co., 1 Mo. P. S. C. 175. There was no evidence offered in this case to justify a departure from the holding in the Cole case, supra, and

we conclude that the rule of defendant which permits a charge of one dollar for restoring service when it has been discontinued for non-payment, therefore, is not unreasonable. It was held in the Cole case that 24 hours' notice in writing should be given before discontinuing service for non-payment. The Commission has now under consideration the adoption of a general order requiring 48 hours' notice in writing to be given a consumer before discontinuing service for failure to pay for the service, and defendant will be permitted to make such an amendment to its rule."

The Commission disapproved of a proposed rule, filed by the company, which would give the company the option of setting a meter and changing a flat-rate consumer to metered service. The rule was intended to prevent waste in instances of abuse of flat-rate service, but the Commission says: "There is a grave question as to whether consumers owning meters are not unjustly discriminated against in being required to pay at the same rates for equal quantities of water as consumers having meters furnished by the company, even when the choice between flat and meter rates is with the consumer; much more would it appear unjustly discriminatory if the company could arbitrarily place one or more consumers in the same class on metered service and at the same time refuse flat-rate service to those consumers owning meters, in one case furnishing meters and in the other by force of circumstances compelling others to furnish their own meters.

"While there is some evidence as to the equity of placing all consumers in the same class on metered service, yet so long as defendant company offers service to consumers of the same class under schedules of flat rates and metered service, particularly as there is so large a proportion of the total number of consumers on flat rates, it appears that either schedule of rates should be open to all consumers in the same class alike, and upon their own option, of course, under reasonable rules and regulations applying to each form of schedule."

The Commission also refused to approve a minimum-charge provision, stating that there was no evidence submitted sufficient to show that the proposed charge is reasonable. The Commission says, however:

"We have heretofore decided that a minimum charge in connection with reasonable meter rates is reasonable to properly distribute the burden of total cost of individual service between consumers, where the amount constituting a reasonable minimum charge was determinable from the evidence. (Brown v. Lawrence County Water Co., 1 Mo. P. S. C. 363; Calvert v. Clinton L. & W. Co., 1 Mo. P. S. C. 191; Meek v. Consumers' L. & P. Co., 2 Mo. P. S. C. 122; City of Mexico v. Mexico Power Co., 2 Mo. P. S. C. 177.)"

NEW HAMPSHIRE.

Grafton County Electric Light and Power Company. The Supreme Court has set aside the order of the Commission, which refused to authorize the issue of capital stock for the purchase of additional properties. This case was reported in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, March 13, 1915, page 493, but may be briefly reviewed here.

The Grafton County Company applied for authority to take over the properties of the Lebanon and Mascoma electric companies. The Commission refused to authorize the purchase, on the ground that the price at which the properties were to be taken over and capitalized was in excess of their fair value.

The case was appealed to the Supreme Court, and the court held that it was unnecessary to consider the question of capitalization, until the question of the public good involved in the consolidation has first been decided. In its supplementary report the Commission says that there is no evidence to support a finding that this transfer will be for the public good, but that there is evidence to the contrary. The opinion says that the proposition to which approval is asked is a capitalization pure and simple, the sole purpose being to issue a much larger volume of securities than is now outstanding without increasing the value of properties devoted to public use, the new securities to be sold to the public.

The finding of the Commission that the transfer was against the public good is now set aside in the decision of the Supreme Court, and the case is remanded to the Commission for further consideration.

WISCONSIN.

Beloit Water Gas and Electric Company. The decision is supplementary to an order of the Commission, issued July 19, 1911 (7 W. R. C. R. 187), and modifies the charges for the water and electric service.

In the former decision the Commission allowed 12 per cent overhead charges in its valuation of the property. The Commission says that a review of the testimony secured at the time the case was first under advisement, coupled with the existing knowledge of the original estimates, leads to the conclusion that further consideration should be given the matter of overhead. "In view of the fact that in the past it has been shown that there often occur discrepancies between estimates of construction cost and actual cost (which should, of course, be analyzed to obtain their relevancy and bearing upon the determination of the cost) and further that there are quite often expenses incurred in construction work which are not represented in the completed structures it would seem unfair and unjust to the company to place the appraisal for rate-making purposes at any figure which is lower than the amount determined by such experience as that described.

"In view of both the general data and local data available, and in view of further investigations as regards the facts in this particular case, and a knowledge of the make-up of unit prices, we believe that the addition of 15 per cent to the sum of the various items, as shown in the appraisal, represents in the present instance a fair allowance for the indirect or overhead cost."

In regard to the company's claim for going value, the Commission says: "Computations upon the 'deficit' basis, which takes into account past losses and the offset obtained by recent earnings, indicate quite clearly that the company has not only earned enough in the past to wipe out the original cost to it of developing its water business, but that even under present conditions it would cost considerable sums to reproduce the water business as it now stands. It cannot be denied that development costs of this kind are actual and necessary.

"They belong among those classes of costs, which, on the ground of equity, as well as because of public policy should ordinarily receive consideration in fixing the amounts upon which, under normal conditions, public utilities are entitled to reasonable returns for interest and profits. To consider such costs in determining the cost value of the property of public utilities that is actually used in serving the public is of special importance in cases where the returns on such cost values are not fixed at higher figures than those which will barely bring the necessary capital and business ability into this field. (Superior Commercial Club v. Superior W. Lt. & Pr. Co., 1912, 11 W. R. C. R. 704, 744.)

"In this case analysis shows that an amount not exceeding $20,000 can be justifiably allowed as the cost of building up the water business."

At the time the former order was issued the water utility discontinued flat-rate service and changed to meter rates. No data were available for metered service, and the rates established were necessarily tentative. After a year's trial of these rates the Commission finds that they are inadequate.

The importance of establishing adequate rates is discussed at length and it is held to be as important to increase

rates when they are too low as it is to decrease rates that are excessive. The Commission says:

"We do not need to emphasize the fact that the corporations or individuals who exercise public-service functions are neither benevolent nor philanthropic institutions. They are primarily established through a desire for gain, and only so long as it is profitable for them to do so, will they continue to perform the service under ordinary conditions. Where earnings decrease, a utility's service invariably deteriorates, gradually but inevitably, nevertheless, culminating in more or less complete extinction. Sometimes the lapse is more sudden. Irrespective of the form it comes in, if the returns are insufficient, failure to give the service must result."

The lighting rates fixed in the former order are left unchanged, except that in determining active connected load, the first 1,000 watts of appliance load of each consumer is excluded. Appliances are used almost wholly off-peak and it is believed should be given the benefit of as low a rate as possible.

New rates were ordered for commercial power service consisting of a service charge of 25 cents net per active horsepower per month, plus an output charge of 4 cents net per kilowatt-hour for the first 1,000 kilowatt-hours per month, scaled down to 1.5 cents net per kilowatt-hour for all in excess of 40,000 kilowatt-hours per month. A minimum bill of $1.25 per month and a reconnection charge of $1.00 were approved in the schedule for power.

The Westboro Telephone Company served notice upon the Commission and upon telephone companies operating in the neighborhood, of a proposed extension of its telephone system. No notice was served upon the Whittlesey Telephone Company, and this company later complained to the Commission that its rights were being encroached upon in the village of Chelsea by the extension in question. The decision says that it is the duty of the proponent company to give the statutory notice. The Commission was aware that the Whittlesey Company was giving service in Chelsea but even if the Commission had construed the notice of the Westboro Company as meaning that it intended to build into Chelsea, the law places no obligation upon the Commission to notify companies of proposed extensions by other companies into their territory. The decision says: "To make an extension without having fulfilled all of the requirements is to make it at the risk of having the law invoked by the company whose territory is invaded. Such is the situation in the present case. It is one whose occurrence has not been infrequent since the passage of the Anti-Duplication Act, but which we trust will occur with less frequency as the companies become more familiar with the law.

"It has been the disposition of the Commission to regard extensions completed without observance of all the requirements of the statute as though they were merely being proposed, and to allow them to remain if they were such as would have been permitted to be built had all the statutory steps been taken. The evidence in this case, however, does not indicate that the Westboro Telephone Company would have been permitted to make the extension into Chelsea had the Whittlesey Telephone Company been given an opportunity to object." The Commission finds that the service in Chelsea is without lawful authority.

Wisconsin-Minnesota Light and Power Company. Complaint was made that the company refused to make an extension of its line. The company based the cost of the desired extension upon a better grade of construction than is used on other parts of its system and upon other systems throughout the state. The Commission says that while the grade of construction undoubtedly represents good practice it would be unfair to estimate the necessary investment in the extension upon this basis. The Commission estimated the cost at $114.47 and a possible revenue from the extension at $48.48. In order to determine whether this prospective revenue is sufficient to justify the necessary investment, two methods have been followed. On one basis it appeared that an investment of $123.19 for extending service to the Barker and Tibbetts residences would be warranted. A further calculation was made as follows. It was assumed, on the basis of average conditions, that the operating expenses of a plant similar to that at Chippewa Falls would not exceed 70 per cent of the gross revenue, and that the distribution system constitutes approximately 45 per cent of the total property value. Therefore, the capitalization of 30 per cent of the estimated gross revenue should represent the total investment warranted by such revenue, and 45 per cent of this capitalized value would represent the investment apportionable to the distribution system. Applying the estimated revenue in the present case the following results are obtained:

Estimated gross revenue	$ 48.48
30 per cent of gross revenue...	14.544
30 per cent of gross revenue— capitalized at 5 per cent.....	290.00
45 per cent of $290.00	131.00

The rate of five per cent was used, inasmuch as a company ordinarily spends some effort in the promotion of business and will usually accept additional business at a very moderate immediate return. By either calculation the normal expected revenue is sufficient to justify the extension prayed for without burdening the consumers with any part of the cost of construction. "The consumers, however, should be willing to guarantee an amount of revenue sufficient to justify the extension on the basis of the calculation, which according to the second method used would be $47.09 per year. This guarantee should be effective until such time as other consumers are given service by means of the extension in question."

The Brodhead Municipal Electric Utility applied for authority to increase rates and to eliminate discrimination in rates. The Commission finds that the plant is in need of extensive replacements. It was stated at the hearing that the city desires the plant to earn more than enough to pay interest on the bonds outstanding. The Commission says: "This is a question of policy for the city to decide. . . . Whatever earnings in excess of bond interest that arise from increasing the rates can be used by the city for any purpose it sees fit. Under the circumstances, it would seem that the best course to pursue would be to hold such earnings in reserve to pay for the replacements that will soon have to be made. This, of course, in reality amounts to an increase in the allowance for depreciation. The distinction, however, need not be argued here. After the efficiency of the plant has been restored to a point where it can be maintained by the ordinary annual depreciation charge, the net income after paying bond interest could be used to retire the bonds of the plant. After the bonds are retired, or even before they are all retired, it would be possible to make a considerable reduction in the rates should the city so desire.

"It will be noted that $400 has been included in the operating expenses for taxes. This amount was included in order to maintain an equitable relation between the consumers and taxpayers. The disposition of this amount is for the city to decide."

The rates are also found to be discriminatory and a new schedule for light and power is ordered put in effect.

In the report of the plant, extraordinary expenses for the year amounted to $2,880. This amount was a death claim paid to the widow of an employee killed at the plant. This amount is not taken into consideration in adjusting rates. The Commission says: "The expense resulting from this personal-injury case could have been covered by insurance. Justice between the consumers and the city would seem to demand that the city exercise ordinary prudence in the conduct of its business. If the city fails to protect itself against the hazards of a business which it has entered, it does not seem

equitable that the patrons of that business should be penalized on account of such neglect."

Fort Atkinson Water and Light Plant. The Commission has issued a supplementary decision to the order under date of July 11, 1913, in which rates were authorized for electric light and power service from the municipal plant at Fort Atkinson (12 W. R. C. R. 26). The matter was before the Commission upon application of the Fort Atkinson Water and Light Commission for authority to increase electric rates and also upon the complaint of L. B. Caswell against the city commission. The city's application for an increase was dismissed after a detailed analysis of operating expenses. Schedules for both urban and rural consumers were worked out which provided somewhat of a reduction in lighting rates in the city, and the city was authorized to put these rates in effect.

In the supplementary decision the Commission says: "The Water and Light Commission has not, until recently, been inclined to adopt this schedule, having been anxious to place the utility upon a sound financial basis before any schedules which would reduce the revenue were placed in effect. Circumstances have now so adjusted themselves that the city commission feels warranted in making a change of schedules."

The operation of the utility for the later period is analyzed and the Commission finds that the schedule submitted in the former decision is applicable to the present condition; and complete rate rules and regulations are included in the order for lighting and power service to city and rural consumers.

Reports of Decisions. Volumes XII and XIII of the decisions of the Wisconsin Railroad Commission, covering the period from May 20, 1913, to February 16, 1914, are now available in bound form.

Electrical Prosperity Week Meeting at Toledo.

Electrical men and retail merchants of Toledo and other northern Ohio cities gathered at the Commerce Club, Toledo, O., on May 6 to hear the plans for the big "Electrical Prosperity Week" campaign. About 275 representative men, all that could crowd into the hall, were present. The meeting was held under the auspices of the Toledo Jovian League. E. R. Kelsey, publicity manager of the Toledo Railways and Light Company, acted as chairman. Guy H. Oliver, tribune of the Toledo Jovian League, called the meeting to order and introduced Mr. Kelsey, who is also secretary of the Toledo Rotary Club.

J. M. Wakeman, Harry W. Alexander and Frank R. Coates, president of the Toledo Railways and Light Company, were the principal speakers at the meeting.

Legal Notes

Legality of Exclusive Agencies Upheld.

The Supreme Court of South Dakota has recently decided a case involving the legality of exclusive agencies which is of interest when considered in connection with the Clayton Anti-Trust Act recently enacted by Congress, says *Printers' Ink*.

It will be remembered that at the time the Clayton Act was passed, there was considerable discussion as to whether or not exclusive agencies would be prohibited by the terms of the act. Section 3 of the act provides that it shall be unlawful to sell or lease, or contract for the sale of goods, or to fix the price of goods on condition that the lessee or purchaser shall not handle any competing line of goods, *"where the effect of such lease, sale or contract for sale or such agreement may be to substantially lessen competition or tend to create a monopoly in any line of commerce."*

The Federal courts will have to decide eventually whether the ordinary contract for an exclusive agency tends "to substantially lessen competition or to create a monopoly" within the meaning of the Clayton Act. The case which has just been decided in South Dakota holds that, under the state statute, an exclusive agency is not illegal, and the reasoning of the court would seem to apply equally well to the language of the Federal statute.

In the South Dakota case the Home Pattern Company had sold patterns to H. O. Rime & Company, dealers in Sioux Falls, upon the condition that they should not sell any other make of patterns. The dealer did not pay for the patterns and when action was brought to recover the purchase price, the defense set up was that the contract between the pattern company and the dealer violated the South Dakota statute against monopolies.

This South Dakota statute provides that it shall be unlawful to enter into any combination either (1) to create or carry out restrictions in trade; or (2) to prevent competition in the manufacture, sale or purchase of merchandise, produce or commodities.

The Supreme Court of South Dakota said:

"Whether treated as an agency or sales contract, there is nothing therein which, in the slightest degree, tends to the creation of a monopoly, or which in any manner tends to interfere with the right of any other persons to offer for sale or sell like merchandise of other makes in direct competition with the sales under the contract in question. So far as any provision of this contract is concerned, the whole world was theirs; the only limitation being that other persons handling similar patterns could not secure defendants as agents or purchasers during the continuance of the contract in question. The defendants, if they purchased said merchandise outright, did not purchase the same as consumers thereof; but purchased the same for resale to consumers. Under such circumstances, we are of the view that the Home Pattern Company had the legal right to enter into a contract with defendants obligating them not to handle like patterns for other parties. There is no unlawful combination or monopolistic trust in such transaction."

It will thus be seen that the Supreme Court of South Dakota was called upon to decide the very questions which the Federal courts would have to pass upon in construing the Clayton Act. This South Dakota case is by no means the first decision by a state court to the same effect. In fact, almost all state courts that have been called upon to decide the question have held that exclusive agencies are not illegal and do not come within the provisions of the state anti-trust laws. Of course, the Federal courts in construing the Clayton Act are not in any way bound by the decisions of state courts. But the South Dakota case is interesting, not only as the latest authority on the question, but also because the reasoning of the court seems very pertinent to the language of the Clayton Act.

Russia has a total of 137 central stations, serving nearly 15,000,000 people.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 281.—Maximum Demand of Residences.—In central-station systems using the two-rate system for residence customers it is customary to charge at the primary rate for the first 30 or 60 hours' use of the maximum demand. Since the cost of providing a maximum-demand indicator for each small customer is prohibitory, in view of the already heavy cost of watt-hour meters, what is the simplest and most equitable way of estimating the probable maximum demand?—E. C. R., Chicago, Ill.

No. 282.—Universal Motors.—What is the relative efficiency of the best makes of small universal motors (say, one-eighth horsepower), that can be used on both direct-current and single-phase circuits, compared with the best makes of direct-current motors and alternating-current motors of the same size? How do they compare in first cost, maintenance cost and general performance?—H. F. S., Peekskill, N. Y.

No. 283.—"Jitney" Bus Regulation.—Have any of the public utilities commissions in the United States taken action to regulate the operation of "jitney" autos with the idea of protecting the safety of the public and the investments of security holders in regularly enfranchised street-railway companies?—T. M., Winnipeg, Man., Canada.

Answers.

No. 276.—Moonlight.—Although the matter may not be electrical, I venture to ask through your columns the reason for the different color of the moon when observed late on a bright afternoon before full moon and when seen ordinarily on a clear night. In the former case it seems very white, while in the latter it has a distinct tinge of yellow.—D. L., River Forest, Ill.

Concerning the color of moonlight, I may say that the only measurements of which I have any knowledge are those made by Langley many years ago in which he says that the color reflected from the moon is such as would be reflected from a surface consisting of yellowish or brown rock. Aside from this the only modification which moonlight would undergo is that due to absorption in the earth's atmosphere, which, of course, varies the appearance through a wide range, much in the same way as the appearance of the sun varies with its altitude and with the condition of the atmosphere. All other apparent changes are doubtless subjective in the sense that they are influenced by contrast with the surrounding light.—E. L. N., Ithaca, N. Y.

I do not agree with the observations made by D. L. respecting the general conditions. There is no reason to believe that the sunlight, as reflected from the moon surface, varies appreciably. Of course the light reflected is of a somewhat different color than that of direct sunlight, but moonlight before it enters the earth's atmosphere is no doubt of constant spectral character. The atmospheric conditions influence the appearance of the moon just as they do the appearance of the sun. We have as a result, in the latter case, the many varied sunsets.

The brightness of the moon on a bright afternoon is roughly of the same magnitude as that of its surroundings, therefore, its apparent color would be the result of a complicated condition; that is, the effect of simultaneous contrast would be apparent and the subjective color appearing on the image of the moon would be dependent upon the color of the surroundings, which would vary from blue skylight, white clouds, to the various tints accompanying sunset. At night when the moon is low it does have a reddish-orange appearance for the same reason as the sun appears red when low on the horizon. This is due, of course, to the selective absorption of the atmospheric dust, smoke, etc. When the moon is near the zenith, however, I cannot believe that a tinge of color is perceptible, inasmuch as there is no color with which to contrast it. Of course, very faint blue surroundings which might be visible on a clear, bright moonlight night should induce the yellowish tinge into the image of the moon.—M. L., Cleveland, O.

No. 278.—Speech Making by Telephone.—Is it feasible to arrange a system of loud-speaking telephones to enable a prominent public speaker to address at the same time not only the audience gathered at the main meeting hall, but also people assembled in overflow meetings near by? Has this ever been done and with what success?—H. N., Philadelphia, Pa.

It is entirely feasible to use loud-speaking telephones in the manner suggested. This has been done in several cases to my personal knowledge with good results. There is, however, the following to be observed in planning such an installation: If the telephones are so situated that a person can hear from more than one source simultaneously, the receivers and lines connecting them to the central apparatus or transmitter must be made electrically the same as regards resistance, impedance and adjustment. If this is not done there will be a difference in voice attenuation that will produce what might be well termed an "artificial echo." This need not be observed in case of receivers spaced not over 20 feet apart for the average hall and need not be considered in case of outdoor telephones, or single instruments.—H. E. W., Chicago, Ill.

No. 279.—Electric Radiator Outlets.—In southern cities where no permanent heating system is provided in buildings it is customary to use a small grate fire, oil stove or gas radiator on the few mornings when it is necessary to take the chill from the room. As the use of electric radiators is likely to increase for this purpose, is there any way to insure that wall outlets that would be used for such radiators taking 600 to 1,000 watts would be wired for sufficient capacity?—G. N. W., Galveston, Texas.

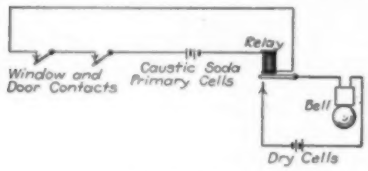
The question covers a condition which has always been a problem to electrical inspectors. On existing installations it is impossible to insure outlets against overloads, especially in connection with heating apparatus which as a rule, is installed by parties who are not familiar with electrical wiring or the rules of the inspection department having jurisdiction. Electric heaters are generally provided with a flexible cord terminating in an attachment plug which makes it possible to connect these devices to the most convenient socket or receptacle, without advice from an electrician or notice to the inspector. It is therefore readily seen that it is not a simple matter to insure outlets against overload. The only way to overcome this condition would be to advise the purchaser of each heater to secure the advice of a competent electrician, or notify the inspection department having jurisdiction, before the heater is placed in service.—E. Q., Brooklyn, N. Y.

No. 280.—Closed-Circuit Burglar Alarm.—A garage situated in the rear of a large residence is to be provided with a burglar alarm of the closed-circuit type to prevent cutting or tampering of the wires. What kind of battery is best suited and cheapest to use on this circuit?—A. T., Evanston, Ill.

The type of primary battery used most extensively at present for all classes of closed-circuit work is the so-called caustic-soda primary battery. In this battery the electrolyte or solution is alkaline, instead of being acid as in the old-style gravity or bluestone cells. The electrodes of the caustic-soda primary battery are zinc and copper oxide and the electrolyte consists of a solution of caustic soda. A battery of this type will give a working voltage of about 0.7 volt and, depending on its size, will give from 300 to 600 ampere-hours of service. It is perhaps the most economical type of battery that can be had for closed-circuit work and will last for about a year without the necessity of a renewal. Since the elements are quite inexpensive, the renewals can be made with small expense. Columbia closed-circuit cell type No. 74, made by

the National Carbon Company, Cleveland, O., is a very good representative of this class of batteries.

Of course, it should be remembered that in a closed-circuit burglar-alarm two sets of batteries should be used, one on closed circuit and the other on open circuit. The closed-circuit battery keeps the relay energized and the alarm bell from ringing. If the circuit is tampered with and broken, the relay is de-energized, closing the local circuit and causing the alarm to ring. This local-circuit wiring may be entirely indoors to prevent any tampering with the wires. The accompanying sketch

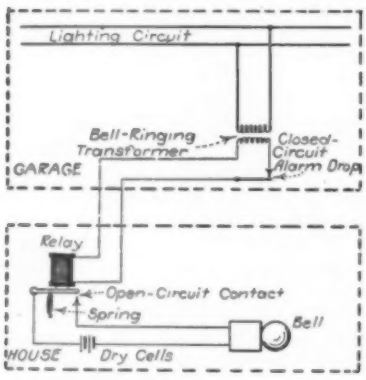


No. 280.—Fig. 1.

(Fig. 1) shows a satisfactory closed-circuit burglar-alarm wiring diagram.—C. A. B., Cleveland, O.

In the end, storage batteries are no doubt the cheapest. However, some good grades of primary cells can be used, if no means of charging are at hand, or the first expense of a storage cell is too high. For this class of work a potential of 6 to 20 volts is sufficient. I have quotations of a prominent retail electrical supply company averaging $1 per 10-ampere-hour two-volt storage cells and $1.50 for a 20-ampere-hour cell. These are of standard make and are probably the best thing to use for a closed-circuit burglar alarm, in the form of batteries.

The Edison and the Gordon cells are



No. 280.—Fig. 2.

good examples of closed-circuit primary cells. The potential per cell is only 0.7 volt, as compared to 2 volts for the storage cell. The cost is about $1.50 for the first 100 ampere-hours and about $1 per 100 ampere-hours for recharge. The operating expense is greater than with storage cells.

As an alternative to using either of the above methods you might buy a bell-ringing transformer having a capacity of about 40 watts for approximately $3, and connect its low-voltage side in series with a pony telegraph relay (costing about $1.50) with the biased spring adjusted to allow the current to just hold the contacts open. Then in case the line from the garage was cut the relay would close a local circuit (see Fig. 2).

In case a storage battery is used the circuit should have resistance enough to cause only a small current to flow. If bluestone gravity cells are used, a certain minimum current must flow to maintain the condition of the cells. I would not advise using bluestone cells, however cheap they may be.—H. E. W., Chicago, Ill

Edison Awarded Medal of Civic Forum.

"Inventor and World Benefactor" was the inscription on the gold medal of the Civic Forum which was presented to Thomas A. Edison May 6 in Carnegie Hall, New York City, as a national testimonial. President Butler, of Columbia University, who presided and made the presentation, said:

"This gold medal is not awarded for any particular achievement, but for distinguished services and great scientific achievements and in recognition of a great career, which has a place among the very highest in the roll of human history."

A poem was written for the occasion by Percy Mackaye and read by the author.

Addresses were made by J. F. Fort; George McAneny, acting mayor; G. Marconi; Richard C. Maclaurin, president of Massachusetts Institute of Technology; Charles A. Coffin, of the General Electric Company; John A. Brashear; and Charles P. Steinmetz.

Letters and telegrams of congratulations and regret at inability to be present were sent by President Wilson, ex-Presidents Roosevelt and Taft, Elihu Thomson, Alexander Graham Bell and many others.

President Maclaurin said, among other things:

"Edison more than any one else in this country has taught men to see something of what science can do. With him there is no conflict between faith and works, for he shows his faith by action. It would, of course, be impossible on such an occasion as this to enumerate the accomplishments of a life so rich in great achievements. With such an embarrassment of riches, it is scarcely practicable even to single out a few of his great accomplishments. Many of you are familiar with what he did in the early days by way of improving the duplex and quadruplex systems of telegraphy, you know of his invention of the contact transmitter and his development of the loud-speaking telephone, of his marvelous invention of the phonograph (Edison being the first to make a record that would *reproduce* sound), you think of his wonderful work in 1878 and later years in developing the incandescent lamp, and you realize that he practically made the *whole* incandescent system, not only inventing the lamp but turning his attention to all its adjuncts, improving the dynamos for such work and providing the necessary means for the distribution of power over large areas. He laid the foundations for the design of central power stations and his Pearl Street Station was a landmark in the history of science. His work in this field is truly phenomenal, the three-wire distribution, the system of feeders entering the net work of mains at different points, the underground conductor system, the bus system in stations, the innumerable accessories of switches, fuses, meters, etc., that he provided are each achievements that would make the fame of any individual. Now that it is all done we wonder at the simplicity of some of the devices just as on reading Newton we are surprised how easy it looks to develop the law of gravitation when once it has been done by the hand of a master."

Philadelphia Section Activities.

The Philadelphia Electric Company Section, National Electric Light Association, held a meeting on April 20 at which E. J. Cattell, statistician of the city of Philadelphia, spoke upon the topic "Making the Most Out of Life." The second speaker was H. Clyde Snook, whose subject was "Roentgenology." His talk was illustrated by a large number of lantern slides, which showed many interesting things in connection with this subject, naturally of particular interest to electrical men. Nominations for Section officers for the years 1915-1916 were made, and a spirited election is promised. The meeting was concluded by a very excellent vaudeville show, and the Section Concert Band interspersed lively, catchy music throughout the entire evening. The attendance was 365.

The April meeting of the Engineering Department Branch was held on April 6. C. J. Russell spoke upon the subject, "Our Suburban Station." He was followed by Farley Ralston, who gave the results of two years of operation in the northern district.

The Meter Department held its April meeting on April 13. The speaker of the evening was J. Washington Logue, whose topic was "Co-operation."

At the meeting of the Commercial Branch, April 27, A. A. Boyle spoke upon the subject, "The Work of the Commercial Inspection Department of the Philadelphia Electric Company." Mr. Boyle is one of the oldest employees in the company, and spoke from experience.

Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

DIRECT CURRENTS.

Problem 36.

A power house operated at a constant bus voltage of 230 volts supplies a load of 500 kilowatts at the end of a transmission line having a total resistance of 0.01 ohm. A series generator driven by a shunt motor is connected in series with the line at the power house, the motor being connected across the line as shown in Fig. 28. The combined resistance of the field and armature of the series generator is 0.001 ohm. The overall efficiency of the motor-generator set is 80 per cent. With the field of the series generator adjusted so that the voltage at the load is equal to the busbar voltage at the power house, find (*a*) the current taken by the shunt motor; (*b*) the armature voltage of the series generator; (*c*) the efficiency of the system from the load to the power-house busbars. Find (*d*) the voltage at the load with the booster removed when the same amount of power is supplied to the load as before and (*e*) the efficiency of the line under the conditions stated in Question (*d*).

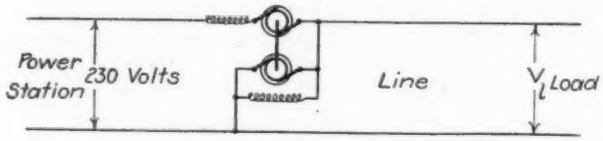


Fig. 28.

SOLUTION OF PROBLEM 36.

Answer to Question a.

The voltage and power at the end of the line being known, the line current (I_1) is given by [19].

$$I_1=500{,}000/230=2{,}170 \text{ amperes.}$$

The resistance voltage (V_r) in the line is then given by [4].

$$V_r=2{,}170\times 0.01=21.7 \text{ volts.}$$

Since the voltage at the load is the same as the bus voltage at the station and there is a resistance voltage of 21.7 volts in the line the series generator must add 21.7 volts to the bus voltage so that the voltage across the shunt motor must be 230+21.7 or 251.7 volts.

The armature current (I_a) of the series generator equals the line current (2,170 amperes) plus the shunt-motor current (I_m) or $I_a=2{,}170+I_m$.

The power output of the series generator is given by [19].

$$P=21.7(2{,}170+I_m)$$

and since the overall efficiency of the motor-generator set is 80 per cent, the power input to the motor-generator set is

$$P=21.7(2{,}170+I_m)/0.8.$$

The power input to the motor is also given by

$$P=251.7\times I_m.$$

Equating these two expressions we have

$$251.7\times I_m=21.7(2{,}170+I_m)/0.8.$$

Solving, I_m equals 263 amperes.

Answer to Question b.

The armature current (I_a) of the series generator is

$$I_a=2{,}170+263=2{,}433 \text{ amperes.}$$

The terminal voltage (21.7 volts) of the series generator equals the armature voltage (E_a) minus the resistance voltage of the armature. Hence

$$E_a=21.7+2{,}433\times 0.001$$
$$=21.7+2.4=24.1 \text{ volts.}$$

Answer to Question c.

The current taken from the busbars being 2,433 amperes and the bus voltage 230 volts, the power taken from the busbars is

$$P=2{,}433\times 230=560{,}000 \text{ watts or } 560 \text{ kilowatts.}$$

Since the power received at the load is 500 kilowatts the efficiency of the system by [21] is

$$\eta=500/560=89.3 \text{ per cent.}$$

Answer to Question d.

With the same amount of power supplied to the load, the line current equals $500{,}000/V_1$ where V_1 is the voltage at the load. The resistance voltage in the line is then

$$V_r=500{,}000\times 0.01/V_1$$

and the voltage at the load equals

$$V_1=230-500{,}000\times 0.01/V_1.$$

Multiplying both sides of the equation by V_1 we have

$$V_1^2=230V_1-5{,}000$$
$$\text{or } V_1^2-230V_1+5{,}000=0.$$

Solving the quadratic equation, V_1 equals 205.8 volts. Another impracticable value will be obtained which should be discarded.

Answer to Question e.

The line current equals 500,000/205.8 or 2,430 amperes. The power taken from the busbars is

$$P=2{,}430\times 230=559{,}000 \text{ watts or } 559 \text{ kilowatts.}$$

The efficiency of the system by [21] is

$$\eta=500/559=89.4 \text{ per cent.}$$

It will be observed that no gain in efficiency is obtained by the use of the series booster and that it only serves to maintain constant voltage at the load. If the series generator is operated at low magnetic saturation its armature voltage will be proportional to the armature current. The action of the series generator used as a series booster then becomes automatic, the voltage added to the busbar voltage being equal to the line drop for any magnitude of line current. The series generator should then be designed to give an external characteristic which has a slope equal to the line resistance.

The series booster is used when it is necessary to maintain constant voltage simultaneously at a distant load and at the power station. If constant voltage is only required at a distant load, compound generators with rising characteristics would be installed in the power station and the series booster would not be used.

SOLUTION OF PROBLEM 86.

Answer to Question a.

Except for a single-phase armature winding the relation between the line current and the phase current for any mesh-connected winding is

$$I_1=2I_p \sin(\pi/n)$$

n represents the number of phases.

For three-phase	$I_1=2I_p \sin(\pi/3)$	$=\sqrt{3}I_p$
For four-phase	$I_1=2I_p \sin(\pi/4)$	$=\sqrt{2}I_p$
For six-phase	$I_1=2I_p \sin(\pi/6)$	$=I_p$
For twelve-phase	$I_1=2I_p \sin(\pi/12)$	$=0.517I_p$.

For any number of phases less than six, the line current is greater than the phase current, but for any number of phases greater than six, the line current is less than the phase current.

Since the rotary converter acts like a synchronous *motor* on the alternating-current side and like a direct-current *generator* on the direct-current side, the effect of the armature currents in producing flux in the air gap equals the *dif-*

ALTERNATING CURRENTS.

Problem 86.

A six-phase rotary converter is rated to deliver 1,000 kilowatts at 600 volts on the direct-current side. The field structure has eight poles, each of which is wound with 1,498 shunt turns and two series turns. The armature core has 168 slots with six inductors per slot. At 25 degrees centigrade, the shunt field winding has a resistance of 76.2 ohms. In the following problem this rotary receives power through transformers from a three-phase, 6,600-volt circuit. Assume that the temperature of the field winding is 75 degrees, and that the efficiency at full load is 94 per cent. When running at no load as a shunt generator a field current of 5.65 amperes is necessary when the terminal voltage is 600 volts.

(*a*) When this rotary delivers 1,000 kilowatts at 600 volts and the shunt-field rheostat is cut out, at what power-factor will it be operating? Will it take a leading or a lagging current? (*b*) If the transformers are connected in delta on the high-tension side and diametrically on the low-tension side, what should be their kilovolt-ampere rating and their voltage ratio in order that they will not be overloaded under the condition given in (*a*)? (*c*) If the transformers are connected in star on the high-tension side and in double-delta on the low-tension side, what should be their kilovolt-ampere rating and their voltage ratio under the condition given in (*a*)?

ference between the effects that would be produced if it first acted as a *motor* and then as a *generator*. By applying this principle it can be shown that the actions of the currents in the armature of a rotary converter either magnetize or demagnetize the field, depending upon whether the current on the alternating-current side is lagging or leading. There is practically no field distortion such as exists in the case of the synchronous motor or of the direct-current generator. This magnetizing or demagnetizing action is due to the wattless component of the alternating current, and the expression for the number of ampere-turns per pole is approximately

$$A=1.2N(I_p \sin\theta)/p \quad \ldots\ldots (1)$$

The factor 1.2 is used instead of 1.414 in order to make a rough correction for the effect of the distribution of the armature winding and of the ratio of the pole arc to the pole pitch. N is the number of turns in the armature winding per pole; that is, it is one-half of the total number of series conductors in the winding divided by the number of poles. $I_p \sin\theta$ is the wattless component of the phase current. p is the number of poles.

The total number of ampere-turns which act on the magnetic circuit is the sum of three components, viz., the ampere-turns due to the shunt field, those due to the series field and those due to the armature current. The shunt field and the series field both produce flux in the same direction in a compound rotary converter. The effect of the armature current is to increase the flux if the current lags and to decrease it if the current leads. The total number of ampere-turns must be sufficient to produce approximately the same terminal direct voltage at no load as a shunt generator as exists under the given load conditions. In this problem the resultant number of ampere-turns per pole must be $5.65\times1,498=8,460$.

At a temperature of 75 degrees the resistance of the shunt field winding is

$$R=76.2(234.5+75)/(234.5+25)$$
$$=90.9 \text{ ohms.}$$

Neglecting the very small drop in the series field, the current in the shunt field winding with its rheostat cut out is

$$I_s=600/90.9$$
$$=6.60 \text{ amperes.}$$

The ampere-turns for the shunt field are $6.60\times1,498=9,890$.

If the rotary delivers 1,000 kilowatts at 600 volts the direct current is

$$I_{dc}=1,000,000/600$$
$$=1,667 \text{ amperes.}$$

This is also the current through the series field turns. The ampere-turns for the series field are

$$1,667\times2=3,330.$$

The total ampere-turns of the two field windings are

$$9,890+3,330=13,220.$$

The armature ampere-turns are determined by $8,460=13,200+A$

$$A=-4,760 \text{ ampere-turns.}$$

The negative sign signifies that the effect of armature ampere-turns is to oppose those on the field poles. The alternating current is thus leading the impressed voltage. When the field ampere-turns outnumber the resultant ampere-turns, as they do in this case, the rotary is said to be over-excited.

The wattless component of the alternating current can now be found by substituting this value of A in equation (1).

$$4,760=1.2N(I_p \sin\theta)/p$$
$$N=168\times6/2\times8=63.$$
$$4,760=1.2\times63(I_p \sin\theta)/8$$
$$I_p \sin\theta=504 \text{ amperes.}$$

The power input to the rotary is

$$P=1,000,000/0.94$$
$$=1,064,000 \text{ watts.}$$

The power supplied to any balanced polyphase circuit, such as a rotary is, is equal to the power per phase multiplied by the number of phases. In this case

$$P=6V_pI_p \cos\theta.$$

In a six-phase rotary the phase voltage is (see Problem 85)

$$V_p=0.354V_{ac}=0.354\times600$$
$$=212 \text{ volts.}$$

The energy, or watt, component of the phase current is

$$I_p \cos\theta=1,064,000/6\times212$$
$$=837 \text{ amperes.}$$

The phase current is

$$I_p=\sqrt{837^2+504^2}$$
$$=971 \text{ amperes.}$$

The power-factor is

$$P.F.=837/971=0.862.$$

Answer to Question b.

The kilovolt-ampere input to the rotary is $Kv.\text{-}A=6\times212\times971/1,000$

$$=1,235.$$

Since the load is divided equally between the three transformers, the rating of each should be one-third of this, or 412 kilovolt-amperes.

If the transformers are connected in delta on their primary sides the high-tension voltage must be 6,600 volts. If the transformers are connected to diametrical points of the rotary's armature on the secondary side the low-tension voltage is what it would be for a single-phase rotary. In this case (see Problem 85)

$$V_{ac}=0.707V_{ac}=0.707\times600$$
$$=424 \text{ volts.}$$

The ratio of transformation is 6,600/424.

Answer to Question c.

The kilovolt-ampere rating of each transformer is of course the same as in (*b*) (see Problem 85).

In the double-delta method of connection each of the secondary windings is divided into two equal parts, *a* and *b*. The windings, *a*, and the windings, *b*, are each connected in delta independently, but the connections of one delta are reversed with respect to those of the other. (For further explanation see a text or handbook.)

The voltage across each of the secondary windings is the same as it would be with a three-phase rotary (see Problem 85).

$$V_{ac}=0.612\times600$$
$$=367 \text{ volts.}$$

If the primaries are connected in star, the high-tension voltage of each transformer is

$$V=6,600/\sqrt{3}=3,810 \text{ volts.}$$

The ratio of transformation of the high-tension to one coil of the low-tension winding is 3,810/367.

DIRECT CURRENTS.

Problem 37.

Two sheets of tin foil each 10 inches square are separated by a sheet of insulating paper. The sheets of tin foil and paper are each 0.002 inch thick. The specific inductive capacity of the paper is 3.

Find (*a*) the electrostatic capacity of the condenser formed by the tin foil and paper; (*b*) the electrostatic charge on the tin foil when a direct emf. of 100 volts is impressed between the two sheets of tin foil; (*c*) the energy of the electrostatic field under the conditions of Question (*b*); (*d*) the current flowing from one sheet of tin foil to the other when the impressed emf. is increased uniformly from zero to 100 volts in one second. (*e*) If a condenser of one microfarad capacity is to be constructed of tin foil and paper of the thickness stated above, which is the minimum volume which it may occupy, neglecting the space required for end connections and overhanging insulation?

This problem illustrates the meaning of electrostatic capacity.

ALTERNATING CURRENTS.

Problem 87.

A 1,500-kilovolt-ampere, 25-cycle, 13,200-volt synchronous generator delivers power over a transmission line and through step-down transformers to a six-phase, 1,000-kilowatt, 600-volt rotary converter. The armature windings of the generator are connected in star and have an effective resistance of 2.83 ohms between terminals. The resistance of the field circuit is 0.802 ohm.

GENERATOR CHARACTERISTICS.

Field Current, Amperes.	Terminal Voltage on Open Circuit.	Terminal Voltage I_a=66, $P.F._.$=0.	Core Loss on Open Circuit, Kilowatts.
50	8,760	.....	10.5
80	12,950	.....	23.2
110	15,500	10,700	35.6
140	17,200	13,200	47.1
180	18,800	15,500	....

The friction and windage loss is 11.2 kilowatts. The transmission line is 10 miles long and consists of No. 3 wires equally spaced two feet apart. The resistance and reactance of this line at 25 cycles are 1.082 and 0.283 ohms per conductor per mile.

Each transformer has a ratio of transformation of 13,200:425 volts. With the low-tension winding short-circuited and with 1,120 volts impressed on the high-tension winding the current is 25.1 amperes and the power is 3,060 watts. The core loss at the rated voltage is 2,120 watts.

The rotary delivers 900 kilowatts at 600 volts and is operating at a power-factor of 0.85 and an assumed efficiency of 94 per cent. (*a*) How should the transformers be connected? (*b*) What is the line voltage where the transmission line enters the substation? (*c*) What is the line voltage at the generating station? (*d*) What is the necessary field excitation of the generator? (*e*) What is the combined efficiency of the generator, line and transformers?

The effect of the line capacity is too small to consider.

This problem illustrates the method of calculating the performance and efficiency of a transmission line together with the generating and receiving devices.

Answers to the above problems and two new problems will be printed in the next issue.

Details of Michigan Section Convention Cruise.

The itinerary of the convention-cruise of the Michigan Section, National Electric Light Association, has been completed and provides for a 1,000-mile trip over three of the Great Lakes. The steamer *Rochester* has been chartered and the entire cruise will be made on this vessel.

The start will be made from Detroit at 1 o'clock, Saturday afternoon, June 26. Proceeding up Lake Huron, Detour, the entrance of St. Mary's River, will be reached at noon Sunday.

Sunday, June 27.

Afternoon trip up St. Mary's River, arriving at Sault Ste. Marie 6:30 p. m. Leave Sault Ste. Marie 11 p. m., passing through the locks into Lake Superior, thence along the north shore of Lake Superior, returning and passing through the locks at Sault Ste. Marie Monday about 11 a. m.

Monday, June 28.

Proceeding down St. Mary's River, passing Detour about 6:30 p. m., and Mackinac Island about 9 p. m.

Tuesday, June 29.

Following the north and west shore of Lake Michigan arrive at Rock Island passage into Green Bay about 6:30 p. m. Passing down the east shore of Green Bay enter Sturgeon Bay about 12 noon, thence through Sturgeon Bay Ship Canal into Lake Michigan. Arrive at Milwaukee about 8 p. m., leave Milwaukee 12 midnight.

Wednesday, June 30.

Arrive at entrance of Kalamazoo River about 8 a. m., proceeding thence into Lake Kalamazoo. Arrive at Saugatuck 1 a. m., arrive at Grand Haven 1:30 p. m.

The entire cost of the trip will be $27.50. Herbert Silvester, 18 Washington Avenue, Detroit, Mich., is secretary of the section.

Chicago Jovian League.

Britton L. Budd, president of the Metropolitan West Side Elevated Railways, was the principal speaker at the luncheon of the Chicago Jovian League on May 10. He showed stereopticon views of various sections of the city before the advent of elevated service and at present, to indicate the rapid improvements that follow transportation facilities. Statistics were presented on traffic in Chicago and comparisons made with other cities. Mr. Budd spoke of the need of a subway and thought that this should be operated in conjunction with the elevated system.

Victor Tousley appointed a committee to draw up suitable resolutions of sympathy in connection with the death of Elbert Hubbard.

General Electric Annual Report.

The General Electric Company has issued its annual report for the year ended December 31, 1914. The income account compares as follows:

	1914	1913
Sales bill	$90,467,692	$106,477,439
†Costs	81,496,728	96,207,834
Profit	$ 8,970,963	$ 10,269,605
Interest, royalties and sundry profit	1,570,431	1,478,722
Increase from securities	1,313,989	2,317,463
Total income	$11,855,383	$ 14,065,789
Debenture interest	567,556	576,432
Net profit	*$11,287,827	$ 13,489,357
Dividends	8,142,767	8,149,204
Surplus	$ 3,145,060	$ 5,340,153
Discounts and expenses securities issued		431,478
Balance	$ 3,145,060	$ 4,908,674
Previous surplus	16,939,819	12,031,145
‡Add		
Stock dividends		
P. & L. surplus	$20,084,879	$ 16,939,819

* Equal to 11.12% earned on capital stock, against 13.2% earned on $101,381,200 previous year.

‡ Add surplus taken over from the Fort Wayne Electric Works and Sprague Electric Co. acquired June 1, 1911.

† Includes cost and expenses of development, manufacturing, selling, administration and patents, and also depreciation in factory and plants.

The consolidated balance sheet as of December 31, 1914, compares as follows:

ASSETS.

	1914	1913
Patents, franchises and good will	$ 1	$ 1
Factory plants, etc.	31,063,332	29,427,170
Real estate	872,216	1,058,386
Stocks and bonds	29,667,213	25,964,317
Cash	22,528,888	14,844,210
Notes and accounts receivable	19,091,026	26,210,459
Due from allied corporations	5,059,860	6,817,563
Work in progress	843,072	2,012,514
Factory investment	24,253,704	31,697,056
General and local investments	3,256,881	4,010,538
Consignment	1,781,177	2,083,145
Total	$138,418,371	$144,125,360

LIABILITIES.

	1914	1913
Capital stock	$101,485,700	$101,381,200
5% debenture, '92	2,000	16,000
5% debenture, '07	18,500	88,500
3½% debenture, '52	2,047,000	2,047,000
5% debenture, '12	10,000,000	10,000,000
Accrued interest	196,527	197,017
Accrued taxes	464,116	302,134
Accounts payable	1,655,226	2,846,657
Notes payable		8,000,000
Advance payment on contracts	434,705	
Dividends payable	2,029,718	2,027,472
P. & L. Surplus	20,084,879	16,939,819
Total	$138,418,371	$144,125,360

Chairman C. A. Coffin says:

"In common with commercial interests generally, the business of your company experienced marked contraction during the year 1914. Had not a large volume of unfilled orders been carried over from the year 1913 the effect of the general depression would have been still greater.

"While there was a decrease of about 25 per cent in the value of orders received, the total number of transactions was practically equal to that of the previous year. The unfavorable relation between the number of orders and their value, characteristic of periods of depression, has operated to increase materially the cost of securing and handling business.

"As a result of business contraction the number of employees engaged in your factories and offices and in those of your subsidiary companies at the end of 1914, was about 15,000 less than in the previous year.

"The company has followed its customary practice in writing off against income account its total expenditures in 1914 for patents, applications, licenses under patents and other outlays relating thereto, amounting to $408,536. The patent account is, therefore, carried at $1.00.

"The manufacturing floor space was increased by 940,000 square feet during the year, but most of this construction was under way when the year began.

"The expenditures during the year, for additions and improvements to manufacturing plants, aggregate $6,006,955, and the amount written off was $4,370,792."

Overhead Construction Work at Khopoli, Bombay.

The power house of the Bombay (India) hydroelectric scheme is situated at Khopoli, which, as the crow flies, is 43 miles from the receiving station on the island of Bombay. Eight 11,000-horsepower sets (of which five are already installed) generate at 5,000 volts, three-phase, 50 periods, the energy being transformed up to a line pressure of 100,000 volts.

The transmission line in the course of its 43-mile route crosses two tidal creeks, a railway and several roadways. A. Dickinson, of Birmingham, England, consulting engineer for the scheme, gave a full account of the electrical and hydraulic sections of the installation at several meetings of the Institution of Electrical Engineers in April. We gather that there will be four transmission circuits for normal parallel working, the circuits being carried on two lines of towers as illustrated herewith. Two change-over stations are provided, each with air-break disconnecting switches. These divide the line into three sections for cutting out or interconnecting different sections as required. The present installation covers two transmission circuits on one line of towers, designed for a working pressure of 100,000 volts between phases. The conductors consist of seven-strand hard-drawn copper wire, the area of each wire being 0.095 square inch, and its weight being between the limits of 364 and 378 pounds per 1,000 feet. The conductivity of the copper is 97 per cent of Matthiessen's standard, and the maximum allowable resistance is 0.255 ohm per 1,000 yards at 60 degrees Fahrenheit. Samples of the standard conductor are taken at random from each coil during manufacture and are tested in tension and torsion machines. The mechanical tests are a breaking stress of 5,400 pounds, an elongation of one per cent in six inches, an elastic limit of 3,800 pounds, a torsional test of fifteen twists in three inches, and a wrapping test of six times round its own diameter, unwrapped and rewrapped.

For the creek-crossing spans a seven-strand hard-drawn silicium-bronze conductor is used, having an area of 0.169 square inch, a weight between the limits of 648 and 676 pounds per 1,000 feet, and a resistance of 0.514 ohm per mile at 60 degrees. The mechanical tests are a breaking stress of 14,000 pounds; an elongation of 1.25 per cent in six inches; an elastic limit of 10,500 pounds; eight twists in six inches; and a wrapping test of six times round its own diameter, unwrapped and rewrapped. Individual wires of each conductor are drawn in as long lengths as possible and where joints are used they are silver-brazed, the conductors being supplied in standard lengths of 2,200 yards.

For jointing up on the site a twisted-sleeve mechanical joint is used, which is made by passing the two ends of the conductors in opposite directions through a copper sleeve, then clamping the wires and sleeve together with two clamps and rotating the clamps in opposite directions until the joint is made in several complete twists.

The conductors are spaced 10.5 feet apart, and in the case of the intermediate towers are arranged in a triangle on either side of the tower, suspended on six-unit insulators. In the case of the anchor towers the conductors are arranged vertically on either side of the tower and are suspended on six-unit insulators. For the creek-crossing towers seven-unit insulators are used, the conductors being arranged vertically on either side. The suspension insulators are ten inches in diameter, and are of two types, viz., of the metal-hooded type with ball joints for using vertically on intermediate towers, and of the link type for using horizontally on anchor towers. They are made from the best grade of non-absorbent porcelain, highly vitreous, of uniform hard glaze, dark gray in color, with metal hoods of malleable cast iron and suspension links of galvanized mild steel, the threaded parts being sherardized and a special non-hygroscopic cement being used for cementing up the parts. The arrangement for attaching the suspension insulators consists of a sleeve in which the conductor is clamped, and for the anchor insulators a gripping sleeve through which the wire is passed and fastened with a split nut, all the parts being galvanized.

Each unit with fittings in place is subjected to a mechanical test of 1.5 tons tensile stress for the suspension type, and 1.75 tons for the strain type, the stress being applied for ten seconds in a tension testing machine. The completed units are subjected to an electrical dry test of 60 kilovolts for five minutes and 70 kilovolts for one minute, a sine wave at 50

cycles being used. The insulators have to withstand such tests without flashing over or showing any defects.

The towers are of Siemens-Martin steel having a tensile strength of 28 to 32 tons per square inch and 20-per-cent elongation of standard test pieces, and are built in two sections, a superstructure and a base riveted to the former on site. Three types are used: suspension, anchor and special towers at creek crossings, about 500 in all being required. The design of all towers is based on a wind pressure of 25 pounds per square foot, the sag of the wires being regulated to give a factor of safety of four at this pressure and at a temperature of 50 degrees Fahrenheit. The suspension towers are designed to withstand any two conductors breaking, and the anchor towers to withstand all the conductors breaking on one side. In addition to the stress due to wind, the anchor towers are designed for a change in direction of thirty degrees from the straight, up to an angle of 150 degrees between the circuit, in the vertical or horizontal direction.

One of the illustrations given by Mr. Dickinson, and reproduced herewith, illustrates the three types of towers used. The ordinary towers are 62 feet high from the ground and are spaced 500 feet apart. The creek-crossing towers are 160 feet high from the top of the caissons, in order to comply with the government requirement that no part of the transmission line shall be within 80 feet of the water at high tide, and are spaced 1,175 feet apart. Each creek-crossing tower is carried on four caissons, consisting of cast-iron cylinders, six feet in diameter, filled with concrete. One tower of each type was tested to destruction at the maker's works.

The telephone equipment consists of two circuits of No. 14 S. W. G. copper-clad wire having a conductivity of 45 per cent, a resistance of 17.38 ohms per mile, a breaking stress of 44 tons per square inch, and a weight of 103 pounds per mile. On the land portion of the line the telephone circuits are arranged below the power circuits, one on each side of the towers, and are carried on transposition pin-type insulators, intermediate telephone poles being placed midway between the towers; where the transmission line crosses the creeks the telephone circuits are placed above the power circuits. The instruments consist of water-tight, high-tension, terminal telephones, which are installed at the power house, switch towers, and receiving station, and are mounted on marble panels with protection devices. A transformer is interposed between the speaking and ringing apparatus and the line, and hearing takes place through a rubber tube, which provides for safety in the event of the telephone lines becoming crossed with the power circuits.

For removing static disturbances in the telephone line, in the event of a fault on a power circuit, a special type of drainage coil is used. Portable telephone sets are also provided.

A guard wire for protection against lightning is arranged over each power circuit, and consists of a seven-strand steel cable, 0.295 inch in diameter, 0.188 pound per foot maximum weight, and 6,400 pounds minimum breaking strength for the land portion of the line, and 0.378 inch in diameter, 0.309 pound per foot maximum weight and 11,000 pounds minimum breaking strength for the creek crossings. These cables are double galvanized and are boiled in linseed oil.

The equipment at the change-over stations in the line consists of four triple-pole, single-throw, 100,000-volt, bolt-type, out-of-door, disconnecting, air-break switches, which are mounted on seven-unit insulators fixed on wooden supports on the towers and are operated by rods from the ground through bevel gears and rack.

Each of the present circuits will transmit a load of 15,000 kilowatts at 0.8 power-factor with a regulation of eleven per cent and a line efficiency of 93 per cent, and a load of 20,000 kilowatts with a regulation of 14 per cent and a line efficiency of 91.5 per cent.

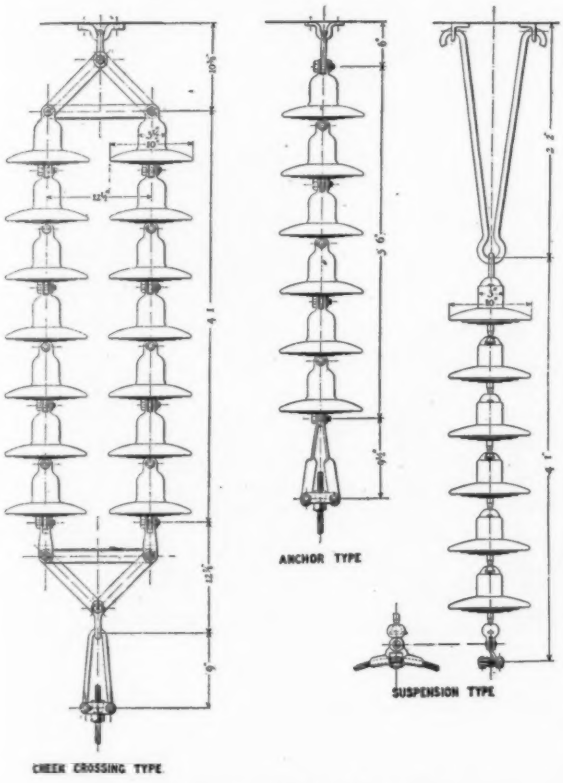


Fig. 1.—Transmission-Line Insulators.

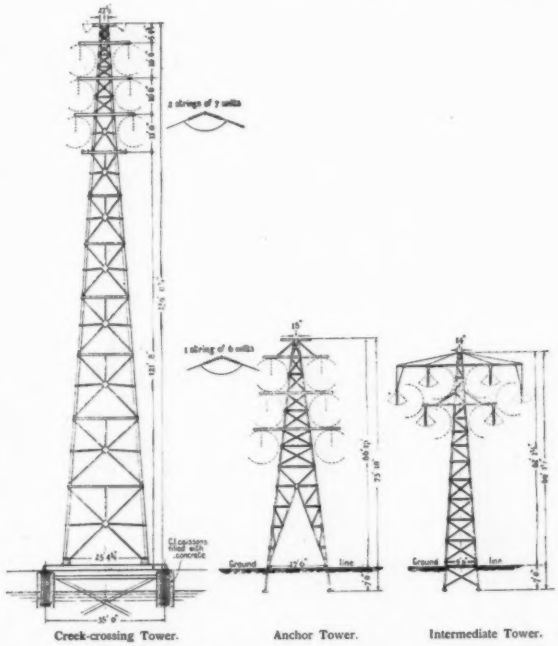


Fig. 2.—Type of Tower Construction Used.

Wireless with Germany.

The wireless-telegraph station at Tuckerton, N. J., carries on regular communication with the station at Eilvese, Germany, over a distance of about 4,000 miles. The number of words handled each week average about 10,000.

Staff Organized to Handle "Electrical Prosperity Week" Campaign.

Nothing is to be left undone to make the "Electrical Prosperity Week" campaign the greatest trade movement in history. The Society for Electrical Development, which has charge of the campaign, has added to its staff two prominent experts on general publicity, advertising and sales management. They are John T. Kelly and C. Ridderhof.

Mr. Kelly has resigned his position as eastern publicity manager of the Panama-Pacific International Exposition, to become editor of the "Electrical Prosperity Week" Campaign News Bureau. He will handle the general news service, besides assisting in the co-operative work with chambers of commerce.

Mr. Ridderhof recently resigned his position as advertising manager of the Hotpoint Electric Heating Company to handle the advertising work for "Electrical Prosperity Week."

Besides the foregoing men, the campaign Executive Committee will have the assistance of advisory committees.

J. A. Randolph, industrial power engineer for the New York Edison Company, and a technical writer of note, is to prepare the trade-press articles on the industrial power applications of electricity.

Miss Grace T. Hadley, formerly associate editor of *Popular Electricity*, will write of the application of electricity to the home. Miss Hadley is to be household editor of the Society's department on home economics.

A. J. Edgell, vice-president of the International Association of Display Men, will handle the details of the illumination end of the big campaign and the co-operative work among merchants and civic associations. He now has charge of the Display Service Bureau of the Society.

Harry W. Alexander, director of publicity for the Society, will have charge of all publicity and sales work.

J. M. Wakeman, general manager of the Society, will have entire charge of all the details of the campaign.

Meeting of Radio Engineers.

At the regular meeting of the Institute of Radio Engineers held at Columbia University, New York City, on the evening of May 5, Benjamin Liebowitz presented a paper on "The Pupin Theory of Asymmetrical Rotors in Unidirectional Fields." The paper dealt first with a simple circuit having no resistance and with a periodically varied inductance, showing in a simple manner that an infinite number of harmonics are generated therein. Leading on to the Pupin theory of two circuits one of which is radiated in the field of the other and upon which a constant voltage is impressed, it was shown that the general theory may be simplified to the extent that it becomes analagous to the first case. The explanation of Pupin's theory to the case including condensers was then taken up and a general application to the theory of the Goldschmidt radio frequency alternator was made.

Illumination of Ohio State Capitol Building.

The illumination of the State Capitol at Columbus, O., is a notable example of co-operation between state and city in creating a beautiful and permanent electrical display. Standing in the center of a ten-acre inclosure in the heart of the business section of Columbus, the gray, gloomy walls of the Capitol gave a somberness to the locality at night which did not seem in keeping with their surroundings. Oppressed with this fact, an organization of local business men made overtures to the state authorities for relieving the situation. Permission was given the body of business men to install at its own expense some dignified system of lighting up the exterior of the building. The problem was submitted to an illuminating engineer in New York City. He prepared plans which were accepted by both state and city, the latter represented by the private organization mentioned. The necessary sum, amounting to $5,000, for the installation was raised by popular subscription.

With its severe outlines, the Capitol lent itself to electrical treatment possibly better than a more ornate building would have done. As will be seen by the illustration, the dome received the largest share of attention. Its panels are outlined by incandescent lamps and there are two circles of lamps at the top. The cornice and pediment of the building are also outlined by incandescents. Within the roof of the dome are concealed lamps with reflectors which throw the light upward on the American flag which floats from the staff. At the apex of the latter is an arc of large power. The halation about the arc prevents the flag from being seen in the picture. Waving in the intense white light the flag is one of the most attractive features. The streaks seen in the left foreground of the picture are from the headlights of passing automobiles.

The Ohio Capitol was completed in 1848. It is regarded by architects of the country as a really great building, perhaps the finest Doric monument on the continent. Its ground dimensions on the ground are 304 by 104 feet.

Illumination of State Capitol Building at Columbus.

The general effect of the illumination is striking. Instead of the building absorbing the light from the surrounding street, it is itself the central point of electrical display. Situated on rather high ground, it can be seen for miles. On approaching the city on a train from the south and west it looms up like a great exposition palace. A further effect suggested is that of placing concealed lamps back of the massive columns, so as to throw them into relief. The current for the illumination is furnished by the state from a plant inside the penitentiary walls.

Electrical Tide Indicator.

Among the interesting exhibits made by the United States Coast and Geodetic Survey at the San Francisco Exposition is a tide indicator, which is connected electrically with a sending apparatus and float on the water front, and shows the rise and fall of the tides at Golden Gate.

Minneapolis Company Employees Hold Show.

The Employees' Mutual Advancement Association of the Minneapolis General Electric Company recently held a spring entertainment, the novel features of which attracted and interested an audience of over 1,500 local electrical men. When plans for the entertainment were first proposed it was thought to work up a small, informal affair, but as preparations progressed the variety of talent among the members of the association was found to be so great that an elaborate program of minstrels, music, monologue and dancing, together with a one-act skit, was arranged. The Bijou opera house was leased and all the electrical contractors of the city were invited. The entire production, from songs to electrical effects, was staged and produced by the employees of the company. Several of the department heads took part. The company's band provided the music.

Minstrel Show of Minneapolis Central-Station Employees.

A novel feature, which appealed to the contractors as much as the entertainment itself, consisted in the distributing of 32-page programs, neatly gotten up, in which each firm was represented by an "advertisement." The advertisement consisted in a witty hit on some phase of the firm's business. The contractors carried these away to treasure as souvenirs which will help them to see themselves as others see them.

Meeting of New York Central-Station Men.

The joint meeting of the Empire State Gas and Electric Association and the Eastern New York Section of the National Electric Light Association opened on Thursday evening, May 6, in the auditorium of the Edison Club, Schenectady, with an address by James O. Carr, the newly appointed public service commissioner for the Second Public Service District of New York. Mr. Carr selected "Public Policy" for his subject and under this heading discussed the relations of public service companies with the regulating authorities, the general public and the employers. L. H. Scherck, president of the Eastern New York Section, presided at this session. Following Mr. Carr's address, J. C. DeLong expressed the gratification which all should feel in that there is now a member of the Commission who through long association with the business is familiar with the many problems with which the operators of gas and electric properties are confronted.

The meeting was continued on Friday morning at the Mohawk Golf Club with Mr. DeLong, president of the Empire State Association, in the chair. This session was devoted to a paper by Henry Flood on "Hydro-electric Power—Its Generation and Distribution." At 12:30 a buffet luncheon was served and at two o'clock the delegates reconvened and listened to a most interesting account by S. W. Stratton of the work of the Bureau of Standards.

Friday evening there was a dinner in the ballroom of the club at which the delegates were joined by a number of representatives of the General Electric Company. Mr. DeLong acted as toastmaster and called on the following speakers: J. R. Lovejoy, W. J. Clark, E. F. Peck, James O. Carr, T. R. Beal, Frank H. Gale and H. M. Wilson. Entertainment in the form of songs and take-offs on various people present was provided by local talent connected with the General Electric Company.

The last session of the meeting was held on Saturday morning when A. D. Dudley, of the Syracuse Lighting Company, read a paper on "The Small Consumer—A Problem." An animated discussion followed. The meeting as a whole was voted a great success by all of those present.

Annual Meeting of the Society For Electrical Development.

The annual meeting of the Society for Electrical Development, Incorporated, was held at the Engineering Societies Building, New York City, on May 11, at 10:30 a. m., with President Henry L. Doherty in the chair. The attendance represented considerably over a quorum, and the result of the ballot for directors was as follows:

Representing central stations, J. F. Gilchrist.

Representing electrical contractors, J. R. Strong.

Representing jobbers, Frank S. Price.

Representative at large, Charles W. Price.

Treasurer Smieton reported a balance in bank of over $75,000, and General Manager J. M. Wakeman presented a report in full covering the proceedings of the past year and the plans for the ensuing year, with particular reference to Electrical Prosperity Week, to be held the first week in December.

Amendments to the constitution, as proposed at the previous meeting of the Board of Directors, were adopted without change.

LETTERS TO THE EDITOR.

The Illuminating Engineering Society.

To the Editor:

It is difficult to see what good purpose you expect to accomplish through your editorial "Financing Engineering Societies" in your issue of May 1, which took the form of a criticism of the management of the Illuminating Engineering Society, and particularly of the proposed amendments to the Constitution of that society. If it was your purpose to express in a manner friendly to the society your disapproval of its method of carrying on its affairs, and of the proposed changes in its organization, it would seem that you might have accomplished your purpose better by a criticism founded on the facts as they exist, regarding which you might readily have obtained exact information.

Regarding your criticism of the financial management of the society others are more competent to speak than myself, but it will do no harm to remind you that, paraphrasing your own expression, the society does plan its activities in accordance with a budget which has been worked out to fit the existing income, and that it has always lived within its income. Therefore your statement that the Illuminating Engineering Society is an example of the opposite procedure is erroneous.

With respect to the proposed amendments to the Constitution as affecting the membership of the society, I am in a position to speak with intimate knowledge of what has been done and the reasons therefor. It is proposed that the society should classify its membership into associate members and members. The purpose of this is twofold. First, to bring it in line with other engineering societies in which similar practice is practically without exception in vogue; second, to increase the revenues of the society from dues. At the present time the society is enabled to maintain its full activity only by the aid of revenue obtained from advertising in its transactions and from sustaining memberships. It is believed that the society will be in a more healthful condition financially when its entire expenses are paid by the regular dues collected from members. It may not be possible to attain this condition, but that this is a proper goal to strive for seems to be beyond contention.

You seem to be much grieved that in the proposed amendments to the Constitution it is provided that only members shall be eligible as officers of the society. It is difficult to see what the basis for your complaint is. Would you consider it desirable that those whose connection with illuminating engineering is so remote that they can enter the society only as associate members should be elected officers of the society? Or would you consider that any one whose interest in the society is so slight that he remains in the grade of associate membership for the purpose of saving $5.00 a year would be a proper person to elect to an office? As it is associate members may still hold office in sections and may serve on committees.

You also stigmatize as absurd the disqualification of sustaining members for office. Would you consider that from the society's point of view it would be desirable that, let us say, the Commonwealth Edison Company should be president of the Illuminating Engineering Society? The restrictions upon sustaining membership were very carefully worked out with a view to maintaining the financial independence of the society, while permitting those who are interested in its work and desirous of furthering it to participate financially, and there has been no indication that this result has not been accomplished.

Your comparison of the Illuminating Engineering Society with the American Electrochemical Society is a very interesting one. As a member of both societies, desirous of furthering the legitimate ends of both, I may say that I do not see that your comparison is entirely fair to the Illuminating Engineering Society. The differences between the two societies are manifold and manifest. The Illuminating Engineering Society maintains regular offices under a paid assistant secretary. The American Electrochemical Society does not do this, but avails itself of the voluntary services of some of its members who give of their time and substance that the membership at large may continue to enjoy the benefits of the society at the rate of $5.00 per annum. It is true that in every active society a very great deal of invaluable voluntary work is done. In its infancy the Illuminating Engineering Society was supported largely in this way. More recently, however, since reaching man's estate, it has not seemed wise to the Illuminating Engineering Society to impose upon some one or more good-natured and efficient members a line of routine work for which every self-respecting member of the society ought to be glad to pay his share. It is to be noticed also that while the American Electrochemical Society publishes most creditable volumes of transactions, yet it does not bring out volumes of transactions throughout the year as does the Illuminating Engineering Society. The latter procedure has the great advantage of putting the matter brought before the society into the hands of the membership with a reasonable degree of promptness, and not in a volume which is put on a shelf without being read. There is no question that the legitimate expenses of the Illuminating Engineering Society as it is being run are necessarily greater than those of a society like the American Electrochemical Society. In other words, the Illuminating Engineering Society is being operated as something more than a $5.00 society. If the membership shows a desire to go down on to a $5.00 basis, undoubtedly this can be done, but the eventual result will probably be the shipwreck of the society and the loss of all the good which now results from its work; and it is believed that there are in the Illuminating Engineering Society a great many members who have a real interest in furthering the cause of the society, whose connection with illuminating engineering is sufficiently close so that they can qualify as members if the new provision of the Constitution is adopted, and who will be very glad to pay their own way in the society rather than to have part of their legitimate expenses paid for them.

To say that the distinction between associate member and member will be a purely plutocratic one is to make the difference between democracy and plutocracy $5.00 a year, an absurdity of statement which you yourself cannot take very seriously.

Your criticism of the proposed change in Article XII is to the extent justified that the remainder of Article XII, which it is not proposed to alter in any way, was not printed in the statement sent out to the membership. There is no proposal to abrogate the remainder of this paragraph.

As to the place and time of holding the annual business meeting, it should be noted merely that the time is fixed and the place indicated in the articles of incorporation of the society, the society being incorporated under the laws of the State of New York.

In conclusion I may say that it is my conviction that the propositions now put forth to amend the Constitution of the Illuminating Engineering Society will bear the closest scrutiny and that the proposed measures will be furthered by nothing so much as by the widest discussion on the part of those who, having the welfare of the society in view, take care to found their arguments on a sure basis of ascertainable fact. CLAYTON H. SHARP.

New York, May 7, 1915.

[Both Dr. Sharp and the writer of the letter which follows, seem to have overlooked portions of the editorial referred to, in which it is suggested that any desired distinctions in the attainments of members may have other than financial recognition, that the present sustaining membership offers a means for those having the will and ability to contribute more largely to the support of the society were it not for the accompanying disqualifications, and that it is doubtful whether the proposed constitutional change will provide any considerable extra revenue. As to the facts in the case of the Illuminating Engineering Society, reference to the official records shows a preponderance of expenditures over receipts for the years ended December 31, 1912, and September 30, 1914. The intervening nine months show a very narrow escape.—EDITOR.]

To the Editor:

Discussion in the technical press of the administration of professional societies is, if well meant, a thing to be welcomed even when it is confined to adverse criticism. Such bodies have, like all human institutions, a tendency toward getting into a rut or falling under the influence of over-energetic members, sometimes not quite disinterested in their zeal; and an excellent corrective and deterrent is knowledge that any faults of commission or omission will be subject to quick public motive. Even mistaken criticism may serve a useful purpose through furnishing an opportunity to dispel a misunderstanding that may be quite widespread. Therefore, what follows is not written in criticism of the editorial in your issue of May 1, entitled "Financing Engineering Societies," but rather to set forth some of the reasons that led to the recommendation by a committee of which the writer was chairman, of the proposals in amendment of the Constitution of the Illuminating Engineering Society that form the main subject of the editorial. A general statement of the situation that led to the proposal of the amendments was sent some time ago to all the members of the society, and what follows may be regarded as supplementary to that statement.

Taking up first the reference to the restriction as to the place of holding the annual meeting, it is perhaps unfortunate that a suggested phrasing was not adopted reading that this meeting shall be held in the state where the society is incorporated. The annual meeting is a formal corporation meeting corresponding exactly to a stockholders' meeting, at which election of officers and other matters legally requiring corporative action are given effect, though in the case of societies, these matters mostly are previously decided by vote of the membership. The impracticability of holding at the same time the annual meeting and the annual convention becomes evident when one recalls that the former is by law required to be held on a fixed date whereas the date and place of meeting of the convention are each year fixed by timely considerations.

In regard to the remarks on the subject of Article XII of the Constitution, the only change proposed is the addition of the following italicized words providing for an omission of the formal statement that results of balloting shall be presented *to the Council and announced by a publication in the Transactions of the Society,* which procedure, of course, has actually been followed in the past. It is difficult to understand how such an addition can be construed to have any bearing whatsoever on those sections of the same article that relate specifically to the manner of amending the Constitution.

The warm defense by the editorial of the supposed interests of sustaining members was doubtless written under a misapprehension as to the public-spirited relation of this grade to the society. The hearty appreciation shown from the beginning by industrial and other non-individual interests in the work of the society suggested the idea of securing subventions from this source to supplement the meager income from membership fees and thus prevent or at least for a time avert the restriction of its usefulness through inability otherwise to cover properly the rapidly growing field of work. To this end the grade of sustaining member, which perhaps should more properly have been termed sustaining associate, was established. The result showed that the confidence in the public spirit of this element was not misplaced, and at present an annual income of about $3,000 is drawn from this source. Moreover, this generous aid has been extended, though not unexpectedly, in a manner highly creditable to the donors, no conditions whatever being attached. It is very doubtful if any of the 33 contributors has ever coveted a privilege to share balloting with the 1,500 voting members. And if eligible to office, a president styled, say, The Board of Water Commissioners of London, Ontario, would be an anomaly as embarrassing to the elect as to the society.

Were the grading of the membership of a professional body an innovation, criticism of such a proposed policy as being "out of place in engineering societies" would be worthy of careful consideration. At the present time, however, such a condemnation is an indictment of the long fixed practice of engineering societies the world over, and therefore any defense of the practice would be quite superfluous. There is, of course, grounds for a difference of opinion as to the expediency of a society taking such a step at a given time. Assuming that the principle of gradation is well founded, or that a society which disregards the principle thereby deprives itself of the full recognition its objects and achievements entitle it, thus affecting its usefulness through being assigned to an inferior status in the sisterhood of societies, the present time seems full ripe for action by the Illuminating Engineering Society, both with respect to expediency and character of membership. If deferred, the practical problem of separating the membership will cumulatively increase, whereas at the present time there are few who will not be inclined to overlook the apparent laxity of the proposed method of separation. In view of the very recent birth of illuminating engineering, almost all members of the society are pioneers in the development of that branch, thus having at least honorary claims for liberal consideration at the time of gradation of the society they assisted to create. While the proposed method of separation may give rise to some inconsistencies, time will apply the remedy. As to future members, gradation will be an incentive rather than a deterrent to joining, by rendering membership more desirable because of the higher status of a graded society in the eye of the public.

As to the editorial comparison with the American Electrochemical Society, none will, I believe, challenge the tribute paid to that sister body, the brilliant career of which has in many respects been an inspiration to the Illuminating Engineering Society, founded three years later. Were the two societies organized and administered along the same lines, the smaller expense of conducting the older body would be at least presumptive evidence of incompetence on the part of past and present officers of the Illuminating Engineering Society. In fact, however, there is a radical difference between the organization of the two bodies, and by no means an identity of aims or close similarity of fields of work.

In order to prevent effectually the Illuminating Engineering Society from coming under the domination of any geographical group of members, it was organized on a sectional basis

rendering impossible its control by only one section. Owing to the embryonic state at its foundation of the art and science the society was to foster, instead of providing for one or two annual meetings and the publication of annual or semi-annual *Transactions*, the desirability of awakening immediate and widespread interest in the objects of the society dictated the plan of monthly meetings of the sections in addition to provision for an annual convention, and also the plan to publish monthly *Transactions*. In order to hasten the development of illuminating engineering to the status of a science and art and to advance its recognition as a profession, work was laid out for numerous committees with consequent incidental expense. Moreover, a general headquarters and staff was necessary in order to co-ordinate the work of the several sections and to furnish service to the large number of active committees.

According to the latest reports available, the American Electrochemical Society had 1,376 members at the end of 1913, and in that year held two meetings which were attended by 84 and 52 members, respectively. The two volumes of *Transactions* issued in 1913 aggregated 828 pages, and 814 pages in 1914. At the end of 1914, the Illuminating Engineering Society had 1,472 members and published in nine monthly sections *Transactions* aggregating 1,072 pages, not counting the pages of the miscellaneous department in each section. During that year there were 37 meetings of sections with an average attendance of 107 at each, and an annual convention was held with a registration of over 300 and an average attendance of 100, 40 and 110, respectively, at parallel sessions.

In its field the American Electrochemical Society is able to accomplish admirably its purposes on an annual membership fee of $5.00. The above comparison taken in connection with the preceding statement of the scope of the work of the Illuminating Engineering Society, indicates clearly why the present activities of that society could not be maintained were it dependent solely on the present membership fees. In a rational classification the society is, in fact, more nearly related to the American Institute of Electrical Engineers, the annual dues of which are $20, $15 and $10, respectively, for the several grades of members.

It may be asked, and with perfect justness, why the society, having fixed its annual dues at $5, should not keep its expenses within the corresponding income. But to have done so in recent years would most seriously have handicapped its usefulness at a critical period; and the endeavor to keep pace with a development in no small measure due to the very activities of the society, met with formal ratification by the membership when it sanctioned the method of increasing the income by accepting grants of money from commercial and industrial interests.

It should also be pointed out that notwithstanding the constantly increasing tax on the resources of the society by the rapid expansion of its field of usefulness, the balance sheet shows a clear surplus of about $1,400, forming part of an investment in bonds. It can be said with no fear of contradiction that few if any professional or similar societies in this country have ever had as skilful and conservative financial management as that for which members of the Illuminating Engineering Society are indebted to its past finance chairman, now treasurer of the society.

In conclusion, the present situation seems to be that, if the income from the membership cannot be increased, the society will soon have to face either a decided limitation of the service it is capable of giving in the advancement of illuminating engineering and of the interests of the illuminating engineer, or of appealing for larger support to the class from which sustaining members are drawn; and the hearty recognition accorded by this class in general to the value of the work of the society augurs well for a favorable response. An organization like the Illuminating Engineering Society is a necessity to the illuminating-engineering field, and if the personnel of that field holds back as individuals from providing a full measure of support to the present society, thereby obliging it to depend more and more for outside support in order properly to carry on its work, the time is apt to come when the control will pass from the former, the society then being controlled by non-individual interests in its field, as in the case of the National Electric Light and American Electric Railway Associations.

W. D. WEAVER.

Charlottesville, Va., May 8, 1915.

Conference of Metermen at Sandusky.

The Meter Committee of the Ohio Electric Light Association held the third general conference for metermen at Sandusky, O., on April 23, at the Sloane Hotel, there being 38 members present. During the forenoon the members who arrived early visited the plant of the Sandusky Gas and Electric Company, and other places of interest.

The formal session of the conference was called to order shortly after 1 o'clock by Chairman A. H. Bryant, of Cleveland. Among the guests from out of the state were John Gilmartin, former chairman of this committee, and A. S. Allbright, both of Detroit. Papers were presented by C. L. Rohrbaugh, of Sandusky Gas and Electric Company, and G. W. Strong, of the Mansfield Light and Power Company on "Meter-Testing Methods and Equipment in the Smaller Central Stations." W. A. Halliday, of Cleveland, read a paper on "Methods of Tests and Errors Involved in the Metering Circuits Which Require Current and Potential Transformers."

J. L. Wright, of the Toledo Railway & Light Company, read a paper on "Diplomacy of Metermen in Connection with the Public." General discussions followed the presentation of each paper.

New Home of American Museum of Safety.

On May 4 a reception was held to mark the formal opening of the new home of the American Museum of Safety, in New York City. The museum was formerly located in the Engineering Societies Building, but in inaugurating a more effective and comprehensive safety campaign it sought new quarters in the working center of the city. Its new home at 14 to 18 West Twenty-fourth Street is in the heart of a great shop and factory district and it is hoped that the gospel of safety will be brought to thousands of workers. Lectures will be held during the noon hour every day so that the crowds of workers from the streets may come in and hear lectures on shop safety and sanitation as well as safety, hygiene and sanitation in the home. The rooms are now on the first floor. This will doubtless lead passers-by to step in, attracted by the displays in the show windows. The exhibits are carefully arranged to illustrate various phases in accident prevention and health promotion and, together with the models in the museum itself, cannot fail to be of educative value.

In opening the new home, President Arthur Williams pointed out the advantages of its new location. He dwelt at some length on the enlarged work in prospect, particularly that aiming to arouse mothers and parents in general to carry the safety movement into the home. It is hoped to impress on them that safety measures are of value not in industrial establishments alone, but can be made very effective in reducing accidents in the home, minimizing dangers from fire, decreasing the liability to disease and promoting the general health of children as well as adults.

New Electrical and Mechanical Appliances

The Benco Weatherproof Pull Socket.

One of the new wiring devices now being actively exploited by the Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill., is the pull socket illustrated herewith. This is an important addition to the popular "Benco" line of sockets, as it contains a switch mechanism controlled by a pull chain, a feature hitherto not perfected in a weatherproof socket.

As a weatherproof socket with any sort of switch mechanism, operated locally, this socket is a distinct development. All other devices of this class have an opening on the side, which allows moisture or vapor to reach the mechanism, making the outfit, therefore, to that extent not strictly weatherproof. This is not true of the Benco pull socket. The chain-pull mechanism is unique, in that it operates vertically, the chain passing down inside the socket shell, at the same time being thoroughly insulated from the current-carrying parts.

Benco Weatherproof Pull Socket.

This pull socket has an interior of molded insulating material, and the underwriters have approved it for a capacity of 660 watts at 250 volts. The socket may be had in either brass, copper or aluminum shells.

The threaded ring on the lower part of the socket affords means for the attachment of shades, globes and reflectors of various types, with fitters ranging from 2.25 to 6 inches.

White Cross Table Fan.

An attractive type of table fan designed especially for use in dining rooms, restaurants and the like, has been placed on the market by the Lindstrom-Smith Company, 1102 South Wabash Avenue, Chicago, Ill. This fan gives a breeze which is of ample volume to be comfortable and yet not too strong to be annoying. The motor is of the universal type which can operate either on direct current or alternating current of any frequency. It can be furnished for any desired voltages from 100 to 220. The fan is provided with a three-speed regulating device, by means of which exactly the proper amount of breeze may be obtained. The fan is noiseless in operation.

White Cross Table Fan.

An ornamental glass bowl is furnished with the fan, which can be placed on top for holding fruit, cake or other objects. If the fan is used on a library table, the bowl may be removed. The entire fan is highly finished in nickel and brass and makes a very attractive appearance. An eight-foot cord and plug is supplied with the fan. Rubber feet beneath the base of the fan prevent marring of highly polished furniture. The fan is 10.5 inches high and 9.5 inches in diameter.

Electric Plant for Santo Domingo.

The need for erecting a new central station at Santo Domingo, capital of the Dominican Republic, is being strongly agitated by both press and public. A committee of the municipal council is studying the problem of ways and means for securing a new plant.

Polarized Motor Plug.

In industrial establishments it is frequently desirable to have a convenient means of connecting up electrically operated machines of a portable or semifixed type by means of interchangeable flexible cords. Such an arrangement avoids having the cord trailing to the machine while it is being moved. A means of accomplishing this connection has been provided by a polarized motor plug recently placed on the market by the firm of Harvey Hubbell, Incorporated, Bridgeport, Conn. The cap for this device is made of an insulating composition and provided with knife-blade contacts; this cap is permanently attached to the machine. The flexible lead has secured to its end a sturdy base with slots fitting the polarized knife blades of the cap. This polarity arrangement insures proper connection at all times. The body of the base is made of composition insulating material and the end is inclosed in brass, thus making it able to withstand severe usage. A cord connected with such a base can be interchangeably connected with any number of machines, each equipped with a polarized cap.

Polarized Motor Plug.

New Type of Gasoline-Electric Tram Car.

The installation of a new type of car will be witnessed in May or June on the Dublin-Blessington tramway line. This railway runs for 20 miles through an interesting residential, health, and scenic district in Ireland, and the substitution of electricity for steam will render traveling more attractive, particularly for those who journey on the top of the double-deck cars.

The ordinary trolley-wire installation could not be used on the whole of the line, and consequently the managing director recommended the adoption of

a gas-electric car, designed by himself, the current being generated by a gasoline engine mounted in the motorman's compartment. A novel feature is the ingenious method by which the cars can also be run over the Dublin United Tramway system, taking their current from the trolley wire in the usual way.

This is believed to be the first time that the gas-electric and trolley-current systems have been alternated, to accomplish which two driving controllers are being provided. One controls the car when it is taking current from the generating set by the regulation of the field of the generator, whereby the voltage of the latter is varied, thereby supplying the car motors with the required voltage at any instant, and enabling the speed of the car to be regulated according to the grade. When running on level track the voltage of the generator will be about 500, thereby giving the maximum speed. When ascending grades this voltage will be reduced, enabling the generator to supply a larger amount of current without overloading the engine. This is an important factor on this line, whose grades are very severe.

The second controller is provided for the purpose of driving the car and working the magnetic track brakes when running on the lines of the Dublin tramways, and is of the usual series-parallel type. It will also work these brakes when used on the Blessington line, the two controllers being interlocked to prevent the motorman making any mistake. A set of controllers will be provided at each end of the car.

The cars will be of the double-deck, double-truck type. The car bodies will be divided inside into two compartments, one first-class, seating 9 passengers, and one third-class, seating 30 passengers. The entrance will be approximately in the center of the car. A staircase at this entrance gives access to the roof of the car. The seating capacity on top is 46.

Mounted on the driving axle of each truck is a Westinghouse 65-horsepower, series-wound, 500-volt railway motor, coupled to the axle through the usual single-reduction gearing. The current for these motors will be obtained from a 65-kilowatt, 500-volt, compound-wound, direct-current generator, driven by a six-cylinder gasoline engine developing about 105 brake horsepower.

The car is lighted from a 30-volt dynamo driven off the main set. In addition to this a storage battery is provided for lighting the cars when standing at the terminus. This storage battery is also used for starting up the main generating set through a special starting controller, the four field coils of the generator being connected in parallel. Each car will be capable of hauling one of the present steam cars as a trailer.

Mission-Style Wooden Lighting Fixtures and Portable Lamps.

There is a general agreement among architects, interior decorators and fixture designers that lighting fixtures should be of a style and finish that harmonizes with the decorative treatment of the different rooms. In bungalows, smoking rooms and dens the mission style is commonly used and to harmonize with it there has arisen a demand for wooden fixtures of appropriate design and finish.

The Ideal Lamp Manufacturing Company, Faribault, Minn., has made

Pendent Mission-Style Fixture.

a special study of this type of fixture in response to this demand. It has placed on the market an extensive line of portable table, floor and piano lamps, brackets, domes and other hanging fixtures. All of these fixtures are made of well seasoned oak and finished either in golden oak, fumed oak, early English or imitation mahogany. Attractive art glass or alabaster glass panels are furnished.

A new design in the Ideal line of fixtures is shown herewith. The only metal about it is the lamp socket. The panels in this case are of alabaster glass which has small absorption. Direct light from the lamp is well diffused through the lower lantern-like panels. Much light passes up to the upper panels and is reflected downward through the open space, part being diffused by these panels, however, to give a pleasing effect to the ceiling of the room and thus taking away the gloominess existing where all the light is thrown downward. The entire fixture is consequently both efficient and pleasing in its general effect.

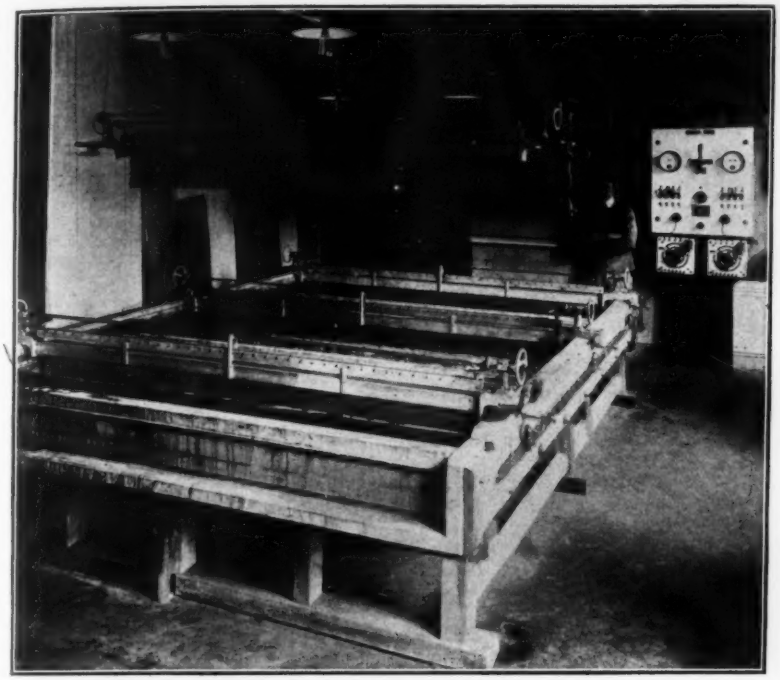
A unique feature of the equipment is the chain suspension made of square wood links. This terminates in a wooden canopy at the ceiling. The over-all length of the fixture as shown is 33 inches and its width 15 inches. The wood can be furnished to match the woodwork in the room and, if moved to a new location, it can be refinished to suit any changed requirements in this regard. A small lamp only suffices to give good illuminating results with this fixture in a room of moderate dimensions. On account of the design of the fixture, being a modified semi-direct, a light-colored ceiling is not required.

French Process for Electroplating Mirrors with Copper.

For some time past inventors have been seeking a good method for covering the back of silvered mirrors in order to protect the reflecting coating from the action of air or of different gases. The usual coatings of varnish were found unsatisfactory, for the reason that such varnishes are apt to contain substances which in themselves, or on account of impurities which they contain, attack the silvered layer. The well known chemist, Liebig, appears to be the first to propose an electrolytic deposit of metal on the back of the mirrors, but this excellent idea could only be applied upon small mirrors except within recent times.

It was desired to extend this process to the large mirrors which are in such common use in houses or stores, and this was carried out by a copper-plating method, in which the current was introduced by means of contacts placed along the edge of the mirror. But this had the great drawback of producing a layer which was much thinner at the middle than at the edges, due to the increasing electric resistance of the silver layer from edge to center. Thus the mirror did not receive a thick enough layer at the middle parts to afford a good protection. In a process of copper plating the difficulty was to multiply the contacts directly placed upon the surface of the mirror and not at the edges, so that the current can be evenly distributed. A direct mounting of contacts on the surface was likely to cause deteriorations to the layer of silver, whose thickness is almost infinitesimal, about 0.0005 millimeter.

Herewith is illustrated the new French process in which these drawbacks are suppressed, it being the invention of Declère, Grésy and Pascalis. The mirror is laid in the electroplating



Tanks and Control Apparatus for Electroplating Mirrors.

bath, or large flat tank, with the silvered side up, and across the tank at a few inches above the mirror are laid a number of copper bar anodes, fastened to the under side of wood cleats. One side of the electric circuit connects to these bars. The originality of the process consists in the method of bringing the current to the other conductor, i. e., the silver layer, without damaging it, and this is done by the use of combs placed across the tank at intervals. Each comb consists of multiple teeth, a tooth being formed by a brass rod with well rounded end, telescoping in a brass rod or socket. When the comb is brought down on the mirror surface all the sliding teeth automatically adjust themselves, so as to make as many contacts upon the silver, using as many combs as are necessary to cover the entire surface of the mirror. Then the circulation of the bath in the tank is carried out by a pump, which draws up liquid from a vat preferably placed below the floor level. Each contact serves for a small surface of the mirror. The current density is 25 to 30 amperes per square meter surface, using about 4 volts on the circuit. The current per tooth is hence very small, and this gives a uniform distribution of current over the surface of the mirror, so as to produce a continuous and homogeneous layer of copper.

Numerous advantages are claimed for the new process. It is now an easy matter to make contact by simply applying with combs, and much labor and time is saved. The current used is very small, which is another good point. The brass teeth are insulated clear down to the ends, so as not to be acted upon by the bath. Again, numerous smaller mirrors can be treated at a time in the same bath. On the whole, the new process is one of great industrial value.

Large Installation of Flashers and Color Hoods in One Block.

The accompanying illustration shows the corner of Madison and Clark Streets, Chicago, and represents some of the most elaborate and intricate flashing effects and artistic designs in electric signs.

On the Clark Street side there is a sign representing a game of pool. The figure representing the player goes through the various operations of breaking and scattering the balls, executing some difficult draw shots, etc.

On the Madison Street side is a facsimile of a man bowling, making strikes, spares, etc. The Golden Pheasant Cafe sign represents a cog wheel action in the border and a 140-foot arrow running along the side of the building and pointing to the entrance. The remaining signs show a variety of spectacular effects, such as fire works, twinkling borders, flames, unique spelling and various other effects which are quite new.

The Reynolds Electric Company of Chicago calls attention to the fact that there are 12 Reco flashers operating the various signs shown in the illustration. All of the signs are tastily decorated in colors and there are not less than 8,000 Reco color hoods on the signs.

The signs are the output of the Federal Sign System (Electric), J. D. Ahearn Company and the Haller-Consolidated Company.

The above shows what can be done in the way of electrical advertising where city ordinances are unfavorable to signs extending across the sidewalk, as is the case at present in the city of Chicago. That the various signs are a paying investment is easily proven by expression of the various owners, who state they would not be without their signs at five times their original cost.

These signs have served to make Clark and Madison Streets a most popular corner after dark and are attracting a great deal of new business.

The dreadnaught *California*, to be constructed at the New York Navy Yard, will be the first battleship propelled by electric motors.

Flashing Signs and Displays at Prominent Downtown Corner in Chicago.

Automatic Reclosing Circuit-Breakers.

A new line of circuit-breakers is being put on the market by the Automatic Reclosing Circuit Breaker Company, Columbus, O. These breakers are a new departure in the application of circuit-breakers for direct-current circuits since they not only open the circuit in case of overload, but automatically reclose as soon as the short-circuit or overload condition is removed. The overload setting has a range of 50 per cent below rating to 50 per cent above. An adjustment is also provided so as to permit the breaker to reclose on any desired amount of load resistance. This renders the breaker capable of distinguishing between a short-circuit condition and the resistance offered by lamps or self-starting motors remaining connected across the line.

These breakers are very ruggedly constructed and are capable of withstanding severe operating conditions. The main contacts are of the usual laminated-brush construction with auxiliary carbon tips for rupturing the arc. The breaker is operated by two electromagnets, and is provided with an air dashpot to regulate the time the breaker will remain open, in case no short-circuit exists.

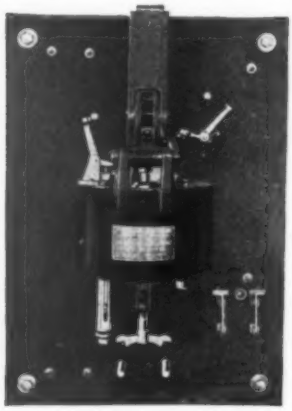


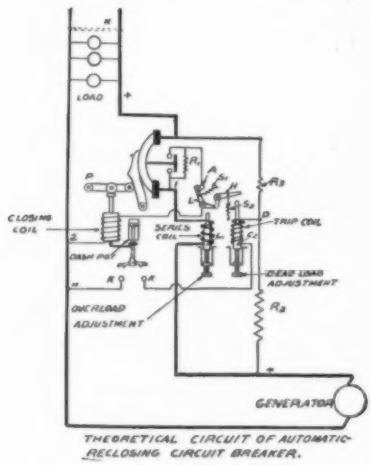
Fig. 1.—Large Circuit-Breaker Closed.

These breakers have been developed for the protection of direct-current generators and rotary converters and also for branch-circuit protection. Since they are entirely automatic and require no attendant, they may be located at any convenient point in the distribution system.

The theoretical circuit for such a breaker is shown in Fig. 2. In operation the main contact is held closed by the acton of an electromagnet, the plunger of which engages an arm pivoted at the point P and having a roller at the other end which is moved upward along the surface of a brush arm which carries the main contact brush.

The closing coil is connected in shunt with the generator circuit between points 1 and 2. At the instant the breaker starts to close current is taken at full potential, but after the breaker closes a resistance R_1 is in circuit with the closing coil, this resistance being of such value as to limit the energy input to the closing coil to a few watts. In Fig. 2 the parts are shown in normal closed position. Suppose a short-circuit should occur in the load circuit as at N; an excessive current would then flow through the series coil and its core C_1 would be drawn upward and its projection cause the bell-crank lever contact L to open the circuit of the closing coil at A, thus allowing the opening of the main contacts. At the instant that L is moved out of contact with A, latch H is actuated by spring S_3 to lock L so as to prevent its return to contact with A, until H is thrown out of engagement. It is now evident that the circuit of the closing coil cannot be closed except by the action of the trip coil which controls the latch H.

After opening the main contacts two things take place: first, a small index current is permitted to flow around the



THEORETICAL CIRCUIT OF AUTOMATIC RECLOSING CIRCUIT BREAKER.

Fig. 2.—Principle of Operation.

break through R_2 and R_3; second the dashpot descends, bridging the opening in the trip-coil circuit at K. The current now flowing through R_2 has two paths by which it may flow to the opposite or negative side of the line. One of these paths is through the trip coil to M and the other through the low resistance R_3 and short-circuit at N and the negative line to M. Now so long as the load resistance or short-circuit resistance is very low the greater part of the index current is shunted around trip coil, but as soon as the short-circuit at N is removed, the load resistance will be such that enough current will be forced through the trip coil to cause it to operate and release latch H, thus permitting L to close the operating coil of the circuit and thereby the main contacts to be closed by the action of the closing coil.

The automatic reclosing of these circuit-breakers works beautifully. It is selective and reduces the circuit interruption to the lowest possible amount.

Annual Celebration of Century Engineering Club.

More than 150 were present at the annual dinner and smoker of the Century Engineering Club, an organization of the employees of the Century Electric Company, St. Louis, Mo., manufacturer of Century single-phase motors and fans, which was held in the banquet room of the American Annex Jovian Hotel, on May 4. The officers and directors of the company were guests of honor.

The program for the evening was of unusual interest. E. S. Pillsbury, president of the Century Electric Company, addressed the club on "Employees as Stockholders," a subject quite apropos since at least one-third of the employees are stockholders. R. J. Russell, secretary and sales manager, spoke on the sale of Century products in the United States and foreign fields. Toasts were given by the other officers and directors. The entire vaudeville and musical program which followed was furnished by members of the club. Those who participated included Paul Clark, J. W. McRae, J. J. Becker, R. B. Hickey, E. Kummings and the Century Orchestra.

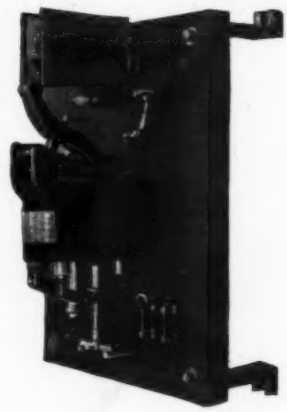


Fig. 3.—Smaller Circuit-Breaker Open.

The organization during the past year has directed its efforts along educational and co-operative lines. The officers of the club are: J. M. Chandlee, president; E. A. Ross, secretary; J. L. Woodress, chairman Program Committee; J. Kramer, chairman Entertainment Committee.

Sperry Gyroscopic Aeroplane Stabilizer.

The Sperry gyroscopic aeroplane stabilizer is designed to take care automatically of the stability of an aeroplane under all conditions of service. An important adjunct to the device is the anemometer, which keeps the aeroplane from falling below the critical speed, thus preventing stalling.

The fact that the stabilizer corrects disturbances at their incipiency, instead of waiting until they have reached considerable magnitude is responsible for

its very decidedly superior control.

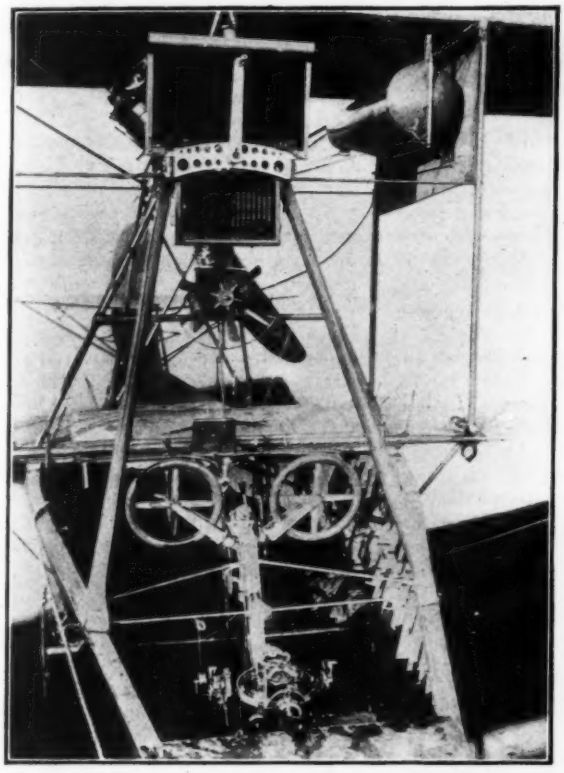
The stabilizer is practical for military and sporting purposes, as it relieves the pilot from nervous and physical fatigue consequent to long flights, especially in rough weather, and allows him to direct his attention to other important matters, such as making observations, signaling, drawing maps, dropping bombs, etc.

The double generator employed furnishes three-phase alternating current and 20-volt direct current. The former is used for spinning the four small gyroscopes and the latter for operating the magnetic clutches of the servo motor and various other supplementary uses. It also charges a special 20-volt Exide storage battery which weighs about nine pounds.

The gyroscopes continue to spin for practically an hour after the aeroplane motor has stopped. The use of the battery is to supply direct current for operating the magnetic clutches, which in turn move the controls, after the aeroplane motor has stopped. This insures stability at all times.

These stabilizer sets have been purchased by the principal governments of Europe, as well as the United States government.

In the accompanying illustration the gyroscope equipment is seen as applied to a biplane. In tests of this device in flight a daring passenger has walked out to a considerable distance between the planes without causing the aeroplane to be thrown out of balance or giving the pilot any trouble in maneuvering the craft.



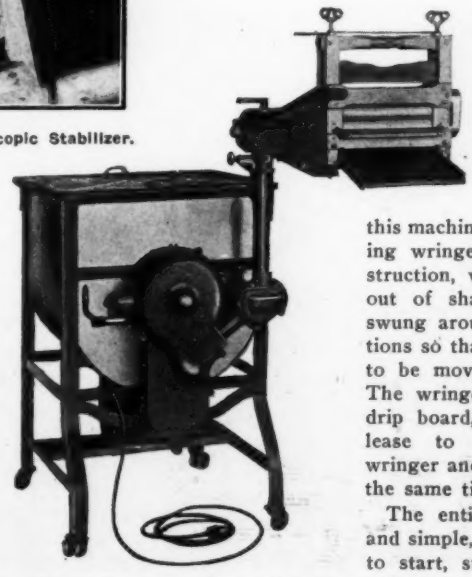
View of Aeroplane Mechanism, Showing Gyroscopic Stabilizer.

An Attractive Exhibit of Linemen's Tools.

The accompanying illustrations show the attractive exhibit of linemen's tools which is being shown with great success at the Panama-Pacific International Exposition at San Francisco, Cal.

The exhibit is set up on two large panels and gives a comprehensive survey of the linemen's tools and other electrical specialties manufactured by Mathias Klein & Sons, of Chicago, Ill.

San Francisco Exhibit of Klein Tools.



Pittsburgh Electric Washer and Wringer.

Pittsburgh Electric Washer and Wringer.

A new and improved type electric washer and wringer is now made by the Pittsburgh Gage & Supply Company, Pittsburgh, Pa. It is illustrated herewith. This washer is so constructed that all moving parts are inclosed. There are no belts or pulleys and consequently no danger of hands, fingers or clothing becoming caught in the mechanism.

The machine is made heavy and substantial, with strong gears so as not to strip. The tub is of copper, tinned inside and perfectly smooth, and will not rust or corrode. Two sizes of machines are made. One has a capacity of 8 sheets and the other 14 sheets. All machines are guaranteed for five years.

The Pittsburgh electric is a cylinder type of washer. The clothes are put into a perforated zinc cylinder which revolves and reverses; the hot water and suds are forced through the meshes of the clothes, and all dirt removed without any rubbing or wear on them.

One of the features of this machine is the reversing and swinging wringer, which is of heavy construction, well braced and cannot sag out of shape. The wringer can be swung around to three different positions so that the washer does not have to be moved or heavy clothes lifted. The wringer is equipped with sliding drip board, and there is a safety release to prevent accidents. Both wringer and washer can be operated at the same time.

The entire device is very compact and simple, there being only two levers to start, stop or reverse washer and wringer.

Switching Equipment in Plant of Indiana Railway & Light Company.

The question of providing additional generating-plant capacity is one that confronts every wide-awake central-station manager, and is a problem often difficult to solve.

By giving due consideration to the ultimate station requirements it is often possible to prevent increased expense attendant upon the failure of equipment to withstand the demand of a normal increase in capacity. There are numerous cases on record where the scrapping of an entire switching equipment, that was otherwise entirely suitable, has been necessary to render the operation of a plant safe. Cases are also in evidence where the complete destruction of the plant was due to the failure of a breaker to clear a short-circuit, the plant having grown beyond the rupturing capacity of the breaker.

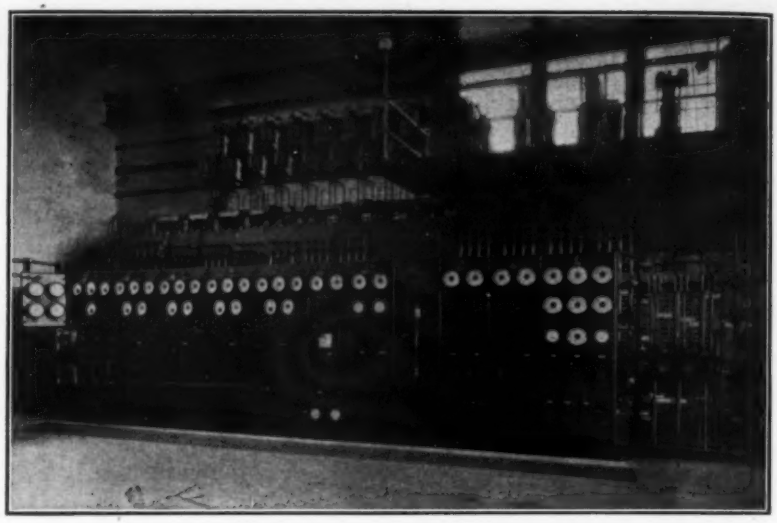


Fig. 1.—Switchboard in Plant of Indiana Railway & Light Company.

No attempts will be made here to discuss the question of rupturing capacity of oil circuit-breakers, as it has already been fully covered by technical papers and societies, except to say that the engineers of the Westinghouse company and other manufacturers have conducted extended investigations, which have been of great value in the design of power stations.

The plant of the Indiana Railway & Light Company, Kokomo, Ind., is an excellent example of the modern application of switching equipment to meet the demands of increasing station capacity. The original switchboard which was installed previous to the investigations above mentioned contained a number of oil circuit-breakers suitable for approximately 6,000 kilovolt-amperes capacity.

The new eleven-panel switchboard shown in Fig. 1 was designed to meet a definite ultimate station capacity of approximately double the original capacity, with a provision for doubling this later on by simply changing four of the circuit-breakers to heavier capacity at a minimum expense. The other breakers are suitable for the maximum capacity required.

There are installed a number of oil circuit-breakers with an automatic rating within the limits of the original installation, namely about 6,000 kilovolt-amperes. By a commonly accepted rule, an automatic breaker rating may be doubled by imposing a definite minimum time limit of two seconds on opening the breaker, or what amounts to the same thing, using the breaker non-automatically. These breakers are applied accordingly, two being used as generator switches, and two others as auxiliary group-feeder breakers with a dennite time-limit relay.

The board, as shown in Fig. 1, contains in addition to the breakers mentioned, the usual complement of instruments for the control of exciters, turbo-generators, rotary converters and feeders.

Fig. 2 gives a general view of the installation, showing lightning arresters and rotaries in the foreground. The 2,200-volt busbars, it will be noted, are mounted up above the board. This is on account of the following reason: Provision is made for accommodating later an auxiliary set of the busbars to enable any feeder circuit to be transferred in case of trouble. This transfer would be to a separate auxiliary oil circuit-breaker fed by an auxiliary bus which virtually gives the advantage of double bus system at a great saving in space and cost.

A particularly noticeable feature of this installation is the mounting of the circuit-breakers and disconnecting switches on pipe framework, the former being operated from the panels by means of bell cranks and levers. This arrangement allows seven feet clear headway between the board and the frame, also between the frame and the wall, and ten feet from the board to the wall.

Another feature of special interest is the addition of an automatic control feature on the horn-gap switches. A small switchboard panel (shown in Fig. 2), mounted near the lighting arresters controls by means of levers and bell cranks the horn-gap switches, and permits their opening on overload or short-circuit, the operating being effected by means of current transformers connected in the 2,200-volt side of the two-to-three-phase transformers.

Fig. 2.—Rotaries and Lightning-Arrester Equipment.

Nearly 6,000,000 electrical horsepower are available from the water powers of Norway.

Current Electrical News

ATLANTIC STATES.

READING, MASS.—This town has voted to appropriate $12,000 to extend its electric light service into the neighboring towns of Wilmington, North Reading and Lynnfield.

HARRISON, N. J.—In connection with plant extensions, the Crucible Steel Company of America will erect a new power station on Cumberland Street. The company is also planning for the erection of a new electric substation. A.

JERSEY CITY, N. J.—Governor Fielder has approved a bill providing for the erection of a power plant for the County Institutions at Snake Hill. It is planned to have the new plant also provide service for lighting the county boulevards. The Board of Freeholders will build the plant. A.

PARKERSBURG, W. VA. — The Parkersburg Electric Company has been incorporated with a capital of $100,000, and is to establish an electric plant.

SPRING HOPE, N. C.—The Eastern Carolina Power and Light Company has been incorporated with a capital stock of $50,000, to establish an electric plant.

NORTH CENTRAL STATES.

ATHENS, O.—In connection with the complete reconstruction of the city's lighting system and the electric plant by the Hocking Power Company, which will take place shortly, the city is contemplating putting in 80-watt nitrogen lamps in place of the 250-watt Mazdas at present used, as it is understood a saving of $30 a year can be accomplished by the change. L.

DAYTON, O.—The project which was defeated a few months ago, an election to pass upon a bond issue for a municipal electric plant, is to be revived, representatives of the Socialist element being engaged in securing petitions for the election. A bond issue of $500,000 is proposed, and petitions have been placed in various parts of the city to enable the voters to sign them. The signatures of 10 per cent of the voters are required. L.

DAYTON, O.—At the quarterly meeting of the board of directors of the Dayton Power and Light Company, the following officers were elected, to take office on and after July 1: President and general manager, F. M. Tait; associate general manager and engineer, O. H. Hutchings; commercial manager, T. F. Kelly; secretary and treasurer, L. K. Funkhouser; assistant secretary and assistant treasurer and auditor, O. E. Howland; superintendent, O. B. Reemelin; power engineer, J. C. Matthieu; engineer of power plants, substations and heating systems, C. H. Spiehler.

ZANESVILLE, O.—C. W. A. Wilson, president of the Southeastern Ohio Railway, Light and Power Company, has been appointed receiver of that organization upon application made by J. M. Brown, of Wheeling. Judgment for $14,080 due on notes was rendered in five suits.

SPRINGFIELD, ILL.—Bills have been passed by the House of Representatives appropriating $140,000 for the installation of a new lighting and heating plant at the state capitol, and to provide $5,000 for new electric elevators.

CADILLAC, MICH.—The city has accepted the proposition of the Cadillac Merchants' Association to pay for the cost of installing the boulevard lighting system in Cadillac, providing the city will pay for the maintenance of the system. Address city clerk.

BEMIDJI, MINN.—The local electric plant has been sold to the Minnesota Electric Light and Power Company. Charles Warfield, who, in partnership with his brother, Andrew, formerly owned the plant, has been appointed local manager.

HENDRUM, MINN.—A proposition for the installation of an electric light system to cost $5,000 will soon be voted upon. Address O. P. Bognes.

RUSSELL, MINN.—The council has voted $7,000 for an electric light and power plant. Arrangements are being made to begin work on it in the near future.

ELDORA, IOWA.—It has been decided by the Iowa River Light and Power Company, located at Eldora, to spend about $50,000 to improve their property during the present season.

SIBLEY, IOWA.—A vote for the installation of an electric light system has been carried. Address town clerk.

GARDEN CITY, S. D.—Public discussion of the lighting needs of this city has resulted in the granting by the council of a franchise to install a modern electric lighting system. The franchise went to G. F. Von Egeler, who will soon install an electric light and power plant.

EMPORIA, KANS.—Gilman Electric Company has been succeeded by Central Electric Company, A. R. Gadberg and R. B. Thomas, proprietors.

PRATT, KANS.—The city commissioners have let a contract for the construction of a city lighting plant to the Connor Construction Company, of Kansas City, the price being $47,262.

SOUTH CENTRAL STATES.

LOUISVILLE, KY.—The Bland Electric Company is lowest bidder on the contract for the wiring installation at the new fire engine house the Board of Public Safety of Louisville is building at Maryland Avenue and the Bardstown road.

LOUISVILLE, KY.—The Childers & Waters Company, for some years one of the leading electrical and supply houses of the city, has amended its charter so as to change its name to the Childers & Waters Electrical Company. The step was taken in order that the nature of the company's business could be determined from the name. C. C. and B. D. Childers and Frank L. Waters and William Ziegler are the members of the company

RUSSELLVILLE, KY.—A movement has been organized for installation of a "white way" here, the lighting standards to extend from the new Louisville & Nashville depot to the public square.

SMITH'S GROVE, KY.—The Town Board has agreed to contribute $150 by appropriation or raise it by subscription toward purchase of the lot on which J. Edmunds, of Pembroke, is to establish an electric light plant for this place. In this connection Mr. Edmunds is endeavoring to ascertain whether an ice plant in connection with the electric light plant could be made to pay.

STITHTON, KY.—The Greenup Electric Company, which operates the electric plant here, has discovered potential hydraulic energy in a constant quantity three miles from the city and is planning to construct an aqueduct with which the water may be piped to the plant and put into service to operate the generating equipment.

ABILENE, TEX.—The Abilene Gas and Electric Company, which is a subsidiary of the American Public Service Company, will enlarge its central power plant here by installing additional machinery and equipment, preparatory to extending its power and light service to the towns of Clyde, Putnam, Baird and Cisco. It will build a transmission line 48 miles long, connecting these towns with the plant at Abilene. G. H. Caffrey is manager. D.

HOUSTON, TEX.—The Houston, Richmond & Western Traction Company has been organized here. It has a capital stock of $50,000 and its purpose is to construct an interurban electric railway between Houston and Richmond, a distance of about 35 miles. Incorporators, Ed Kennedy, W. W. Thomas and J. C. Eganhouse. The building of a power house is involved in the plans. D.

NORTH PLEASANTON, TEX.—L. B. Myers, of El Reno, Okla., and associates will construct a combined electric light and power plant and ice factory here at a cost of about $40,000. D.

TEMPLE, TEX.—An election will be held here June 1 to vote on the proposition of issuing $40,000 of bonds for installing an electric fire alarm system and the erection of two fire stations. D.

VICTORIA, TEX.—The city has voted in favor of the issuing of $40,000 bonds for the erecting of a municipal lighting plant.

WESTERN STATES.

BATTLE MOUNT, NEV. — The Lander Electric Light, Power and Water Company is preparing to erect a power house west of town on a site recently purchased for that purpose.

RENO, NEV.—Articles of incorporation have been filed here for the Nevada Gas, Heat and Light Company, with a capital stock of $1,500,000 by H. H. Dunbar, C. C. Manker, T. B. Wakefield, G. E. Wakefield and J. Smith.

KELOWNA, B. C.—The City Council has taken up with the engineering firm of DuCane, Dutcher & Company, of Vancouver, B. C., the proposition of constructing a municipal hydroelectric light and power plant in this city, same being estimated to cost approximately $120,000. Reported the proposition of issuing bonds for the sum above named will be placed before the voters in the near future. O.

MONTESANO, WASH.—Geo. E. Tildens, of the Seattle Bond and Brokerage Company, is promoting a power proposition to furnish electricity to the towns of southwest Washington. The proposed power site is at or near Lake Cushman.

MORTON, WASH.—F. M. Broadbent, president of the Morton State Bank, and owner of the Morton Electric Company, here, recently sold the power plant to C. O. Smith, of Pe Ell, Wash., for a price reported to be approximately $20,000. It is understood the new owner will expend several thousand dollars immediately in making improvements and extensions. O.

SEATTLE, WASH.—G. A. Collins, I. G. Smith Building, Seattle, has been granted an electrical power and light franchise by the County Commissioners of King County, to supply Vashon and Maury, with light and power. A company has been organized, with Mr. Collins at the head, which will build a power plant and construct transmission lines, over the islands. It is reported officially the company will expend not less than $20,000 in the construction of a power plant alone. O.

SEATTLE, WASH.—Mayor Hiram C. Gill has directed Superintendent of Lighting, J. D. Ross, to obtain options for electrical current from the large lumber mills of Seattle so that, regardless of the sealing of the impounding basin at the New Masonry Dam, Cedar Falls, or the construction of an additional unit to the municipal steam auxiliary at Lake Union, the light department will be assured of sufficient power at all times to serve city light and power patrons and to take care of increasing business. O.

BEND, ORE.—John Steidl and Thomas Tweet have been granted a general electric franchise by the city council.

ONTARIO, ORE.—The City Council is considering an application for a franchise for electric power asked by the Dead Ox Flat Irrigation Company, which owns power rights on the Payette River.

SANTA BARBARA, CAL.—A committee has been appointed to arrange for the installation of ornamental lights on State Street extending from Sola to the beach.

WESTVILLE, CAL.—The Herman Mine Company is preparing to install an electric plant here this spring.

PROPOSALS.

LIGHTING FIXTURES. — Sealed proposals will be received by James A. Wetmore, Supervising Architect, Washington, D. C., until June 3, for furnishing and installing new lighting fixtures in the United States subtreasury at New York City, in accordance with plans and specifications.

WIRING SYSTEMS.—Sealed bids will be received by James A. Wetmore, Acting Supervising Architect, Washington, D. C., until May 25, for changes in plumbing, conduit and wiring system and lighting fixtures in the United States post office and court house at Parkersburg, W. Va., in accordance with drawings and specifications.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 16,555. ELECTRICAL SUPPLIES.—An American consular officer in China transmits a report relative to an opportunity for the sale of electrical supplies. A pamphlet relative to this opportunity may be examined at the Bureau of Foreign and Domestic Commerce or its branch offices.

NO. 16,617. ELECTRICAL GOODS.—An American consular officer in Spain reports that a business man in his district desires to represent American manufactures of electrical goods. Correspondence and literature should be in Spanish.

NO. 16,619. MINING AND ELECTRICAL MACHINERY.—The Department of Commerce is in receipt of a letter from a foreign commission merchant, who is now in the United States, stating that he desires to secure agencies for the sale of mining, mechanical and electrical machinery and instruments. He states that he desires exclusive agencies for Netherlands and its colonies; he has been dealing with his government for 17 years. Foreign and American references are given.

NO. 16,639. ELECTRICAL SUPPLIES.—An American consular officer in Portugal transmits a report relative to an opportunity for the sale of electrical supplies. Samples of cartridge fuses desired may be examined at the Bureau and its branch offices.

NO. 16,654. ELECTRICAL SUPPLIES.—An American consular officer in Italy reports that a business man in his district is desirous of communicating with American manufacturers of electrical wire, switches, incandescent lamps, etc.

NO. 16,693. ELECTRIC FIXTURES, STOVES, ETC.—A firm in Russia, which has already placed orders in the United States for electric lamps, informs an American consular officer that it desires to receive catalogs and price lists from American manufacturers of electric chandeliers, brackets, wall fixtures, and table lamps; electric appliances, such as heaters, sadirons, chafing dishes, boilers, hair curlers, cigarette lighters and novelties; electric wires. Correspondence should be conducted in Russian or French.

NO. 16,741. ELECTRICAL GOODS.—A business man in Spain informs an American consular officer that he wishes to represent American firms which may care to sell electrical goods in that country. He states that he will also buy direct. Catalogs and correspondence should be in the Spanish language.

NEW PUBLICATIONS.

UTILITIES AND MUNICIPALITIES.—Comments on the attitude of American cities toward the utility problem, in the form of two lectures by Morris L. Cooke, director of public works of Philadelphia, have been published by the author under the title of "Snapping Cords," and copies may be had upon application. The lectures were delivered at various Eastern universities.

UNIVERSAL ELECTRICAL DIRECTORY.—The 1915 edition of the "Universal Electrical Directory" has appeared. The American section has been much improved but still leaves much to be desired as to classification. The foreign sections will prove very useful to Americans, manufacturers and others. The volume is published by H. Alabaster, Gatehouse & Company, 4 Ludgate Hill, London, Eng.

NEW INCORPORATIONS.

HASKELL, TEX.—Haskell Ice and Light Company; capital stock, $20,000. Incorporators: Morgan T. Jones, George T. Scales and W. G. Swenson.

POMEROY, O.—The Ohio River Electric Railway & Power Company, recently incorporated with a capital stock of $10,000, has reduced its capitalization to $1,000.

CARUTHERSVILLE, MO. — The Caruthersville-Kennett Electric Light and Power Company has been incorporated with a capital of $200,000 by Jos. S. Wahl and others.

CORTLAND, O. — The Cortland Lighting Company has been incorporated with a capital of $5,000, by O. M. Richards and others, to deal in electricity, power, heat, light, etc.

GENEVA, N. Y.—Sign Ad Company, Incorporated; electrical advertising signs, etc. Capital, $60,000. The incorporators are: Wilmer S. Fallon, Maurice B. Patch and Henry A. Wheat.

DALLAS, TEX.—The Mitchell Electric Garage and Storage Battery Company has been organized here with a capital stock of $5,000. Incorporators: C. Mitchell, Max Rotham and A. Kramer. D.

CINCINNATI, O.—The Electric Service Company has increased its capital stock from $10,000 to $25,000 for the purpose of providing for additional facilities for handling its business.

CHERRY VALLEY, ILL. — The Cherry Valley Light and Power Company has been incorporated with a capital of $15,000, by Louis Koth and others, to manufacture and furnish electricity.

NEW YORK, N. Y.—New York Appliance Corporation; to manufacture electrical appliances, dynamos, etc. Capital, $10,000. The incorporators are Samuel L. Marcus, David Herman and Stephen K. Rapp.

TERRA ALTA, W. VA.—The Terra Alta Lighting Company has been incorporated, with a capital of $23,000, by H. C. Adamson and others, to operate an electric lighting plant. Main office at Waynesburg, Pa.

JAMAICA, N. Y.—Movon Electrical Contracting Company, Incorporated. Capital, $1,000. The incorporators are Alfred A. Green, Brooklyn, N. Y., Alfred L. Green, Rochester, N. Y., and Wallace R. Foster, New York City.

NEW YORK, N. Y.—Monowatt Elec-

tric Import Company, Incorporated. Capital, $5,000; to import electrical goods of all kinds. Incorporators: Nathan Schwartzer, David Davis and Paul F. Altschul, all of New York City.

EAST MOLINE, ILL.—The East Moline Electric Company has incorporated with a capital stock of $5,000. The company is to manufacture electric goods. The incorporators are C. R. Wood, L. M. Moss and Edward Reavy.

CONNEAUT, O.—The H. D. Thayer Electric and Hardware Company. Capital, $15,000; to handle electrical supplies. Incorporators: H. D. Thayer, Bessie B. Thayer, Milford Bulfinch, Mortimer C. Bulfinch and Blakeslee Stoddard.

NEW YORK, N. Y.—Dey Electric Corporation. To develop electric motor vehicles, etc.; capital, $20,000. The incorporators are Henry H. Dey, Jersey City, N. J.; H. W. Hillman, New York City, and Max E. Schmidt, New York City.

CANTON, O.—Electric coffee mills and meat choppers will be manufactured by the newly-organized Canton Electric Cut Co., a $50,000 corporation. Raymond W. Lolchot, Levi Warstler and others are among those interested in the company. L.

NEW YORK, N Y.—The Babylon Power Corporation has been incorporated with a capital of $10,000, to manufacture electricity for light, heat and power. The incorporators are Daniel E. Hanlon, Edgar Hirschberg and John V. Flood, all of New York City.

JENNINGS, OKLA.—The Gate Electric Light and Power Company has filed articles of incorporation and taken out a state charter. It is capitalized at $5,000, and its incorporators are William E. May, Herbert Crowley and M. E. Michaelson, all of Bartlesville, Okla.

CHAMPAIGN, ILL.—The Seymour & White Heath Light and Power Company has been incorporated with a capital stock of $2,500. The company will operate electric-lighting, heating and power plants and sell current. The incorporators are William Murray, Nevada E. and Orlando S. Murray. Z.

WEST SCARBORO, ME.—The Milliken & Snow Company has been incorporated with a capital stock of $10,000, to do a general business in electrical goods and appliances. The following are the officers: President, Alfred H. Milliken; clerk and treasurer, Weston H. Snow; directors, the above and E. C. Milliken; all of West Scarboro. W.

GRANTS PASS, ORE.—Articles of incorporation have been filed here for the Hell Gate Canyon and Coquille Power Company, with a capital stock of $1,000,000, by George E. Sanders and George W. Sorenson, of Grants Pass, and Wharton Plummer, of Chicago. The company plans to furnish the city with power for irrigation and other purposes.

PORTLAND, ME.—The National Transportation Service Company has been incorporated with a capital stock of $50,000, to deal in and operate motor vehicles of all types. The officers are: President, Horace E. Eaton; clerk, Benjamin G. Ward; treasurer, Grover C. Richards; directors, the above and George H. Hinckley and Florence E. Tarr, of Portland.

FINANCIAL NOTES.

The Pacific Gas & Electric Company has called for redemption on May 27, the remaining $1,500,000 of its one-year five-per-cent notes due December 15, 1915. This redemption entirely clears up the floating debt of the company. The original issue of these notes, made December 15, 1914, was $4,212,000.

The Elmira Water, Light & Railroad Company has called for redemption at 105, on July 1, the $1,661,000 purchase money gold 5s which mature on January 1, 1949. The money for the redemption of the issue was obtained from the sale of the company's water-works to the city of Elmira on May 1 for $1,500,000 and the sale to bankers of $232,000 of the company's first-consolidated-mortgage 50-year gold 5s, dated September 1, 1906.

Judge Hook, of the Federal Court, has authorized the receivers of the Metropolitan Street Railway of Kansas City to issue $592,500 receivers' certificates for the purpose of constructing extension to the lines of the company. These certificates, by order of the court are a prior lien on the property, ahead of any bonds, stocks or other obligations. Cost of all extension and maintenance work authorized will aggregate $679,460, but part of this will be paid from earnings.

At the annual meeting of Cincinnati Gas and Electric Company, leased to Union Gas & Electric Company, a subsidiary of Columbia Gas & Electric Company, the board was reduced from 11 to 10 members, no successor being elected to the late George D. Eustis. Retiring directors were re-elected. After providing for charges, including interest, dividends and administration expense of the leased company, it was stated that Union Gas & Electric Company, the lessor corporation, showed a net profit for the year ended December 31, 1914, of $61,000.

To prepare for raising additional capital by the sale of stock, the Westinghouse Electric and Manufacturing Company board has authorized the issuance of some $19,500,000 new convertible five-per-cent debenture bonds. Under the financing plan announced, present owners of the $19,476,000 convertible five-per-cent debenture sinking-fund bonds will receive either cash at the redemption price of 105, par in new bonds convertible into common stock at 100 for the rest of this year and 110 thereafter instead of the present conversion figure of 200, or part cash and part new bonds.

The Portland Railway, Light and Power Company has sold to Philadelphia and New York bankers $5,000,000 two-year five-per-cent notes, callable at par and interest on sixty days' notice. The notes are being offered at 98, to yield 6.10 per cent. Proceeds will go to retire the $5,000,000 one-year five-per-cent notes maturing May 1, 1915. The new notes, as well as the old, are secured by the deposit of the $5,000,000 first-mortgage bonds and the entire capital stock of the Mt. Hood Railway & Power Company.

Federal Judge Alston G. Dayton, acting upon a petition submitted by non-resident security holders of the Martinsburg Power Company, of Martinsburg, W. Va., on April 23, appointed H. H. Emmert and C. E. Martin, of Martinsburg and James H. Harlow, of Darlington, Md., receivers for the power company, and these receivers will proceed immediately with the reorganization and financing of the company in accordance with the agreement entered into several weeks ago with Day & Zimmerman, of Philadelphia, Pa., as 83 per cent of the stockholders are committed to this plan of reorganization. The transfer of the property will be approved by Judge Dayton. The appointment of receivers by the Federal court was secured in order to forestall action in the state court at Martinsburg, in a suit brought against the Martinsburg Power Company by the People's Trust Company of Martinsburg for payment of notes aggregating $22,000 and which also sought the appointment of a receiver hostile to the reorganization plan. The name will be changed to the Potomac Light & Power Company. The capital stock will be increased to $1,000,000, and the two plants on the Potomac River and the one in Martinsburg will be greatly enlarged.

PERSONAL MENTION.

MR. A. E. MORROW has been appointed Chicago representative of A. Hall Berry, New York City, with headquarters at 9 South Clinton Street, Chicago, Ill.

MR. ARTHUR L. WILLIS, of Concord, N. H., has been appointed Commissioner of Motor Vehicles for New Hampshire. This office was created by act of the last legislature and takes over the duties of automobile registration formerly performed by the office of Secretary of State.

MR. O. H. HUTCHINGS has been made associate general manager and engineer of the Dayton Power & Light Company and with Mr. Thomas F. Kelly, commercial manager, will have full charge of the activities of the company during the absence of Mr. Frank M. Tait. Mr. Hutchings was previously general superintendent.

MR. THOMAS F. KELLY, until recently sales manager of the Dayton Power & Light Company has been made commercial manager of the company and with Mr. O. H. Hutchings will have full charge of the activities of the Dayton company in the absence of Mr. Frank M.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	May 10	May 3
American Tel. & Tel. (New York)	119½	122⅜
Commonwealth Edison (Chicago)	—	135½
Edison Electric Illuminating (Boston)	240	—
Electric Storage Battery, common (Philadelphia)	51¼	53½
Electric Storage Battery, preferred (Philadelphia)	51¼	53½
General Electric (New York)	151	160
Kings County Electric (New York)	119	119
Massachusetts Electric, common (Boston)	6⅞	—
Massachusetts Electric, preferred (Boston)	41⅝	—
National Carbon, common (Chicago)	131	—
National Carbon, preferred (Chicago)	—	—
New England Telephone (Boston)	129	128
Philadelphia Electric (Philadelphia)	24	24⅝
Postal Telegraph and Cables, common (New York)	77	80
Postal Telegraph and Cables, preferred (New York)	65	67½
Western Union (New York)	65¼	68½
Westinghouse, common (New York	87¾	103½
Westinghouse, preferred (New York)	120	126

Tait, president and general manager who has removed to New York City.

MR. S. C. ARENTZ was elected president of the Utah Society of Engineers at the annual meeting and dinner which was held April 16 at Salt Lake City. Mr. R. S. Lewis was elected first vice-president; W. A. Wilson, second vice-president; C. J. Ulrich, secretary; L. H. Krebs, treasurer. O. W. Ott was elected member of the executive committee.

DR. H. G. DORSEY, electrical engineer of the National Cash Register Company, of Dayton, O., was the principal speaker at the monthly meeting and dinner of the Dayton Jovian League recently. His address was on the subject of "The Electrical Engineering Work at the National Cash Register Plant," which he covered in great detail and in an exceptionally interesting manner.

MR. H. H. SANBORN and Mr. Arthur B. Roehl have resigned as rate expert and assistant rate expert, respectively, of the California Railroad Commission, and will engage in the practice of law with Mr. H. C. Beach, under the firm name of Sanborn, Beach & Roehl. Offices will be established in the Humboldt Bank Building, San Francisco, Cal., and special attention will be given to corporation and public utility practice.

MR. JAMES CLARK, JR., head of the James Clark, Jr., Electric Company, is a member of the Bureau of Manufactures, a subordinate organization of the Louisville Commercial Club which will have supervision of the permanent exhibition of products of Louisville plants that is being arranged in a hall at Fourth Street and Broadway. Mr. Clark's own company will install an exhibit and the whole of the 21,000 square feet of floor space will be occupied by other articles made in Louisville.

OBITUARY.

MR. EDWARD P. SHAW, JR., general manager of the Boston & Worcester Street Railway Company, died on May 8 at Brookline, Mass., following an operation for blood poisoning. Mr. Shaw was 46 years old, and was treasurer of the New England Railway Club.

MR. C. R. SMITH, assistant general manager of the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., died recently as a result of an attack of heart trouble. Mr. Smith entered the employ of the Westinghouse company 10 years ago, and has held various important posts with that concern since then, being appointed to the assistant general managership three years ago.

MR. GERRIT SMITH, inventor of a system of quadruplex telegraphy, died at Amityville, Long Island, on May 4. He was a telegraph operator in the Secret Service Department of the Federal Government during the Civil War, and was for many years electrical engineer of the Western Union Telegraph Company, retiring 10 years ago on a pension after a service of 44 years with the company.

DATES AHEAD.

Southwestern Electrical and Gas Association. Eleventh annual convention, Galveston, Tex., May 19-22. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Missouri Public Utilities Association. Annual convention, Steamer *Quincy*, May 27-30. Secretary, F. D. Beardslee, 315 North Twelfth Street, St. Louis, Mo.

National District Heating Association. Annual convention, Hotel Sherman, Chicago, Ill., June 1-3. Secretary, D. L. Gaskill, Greenville, O.

National Electric Light Association. Annual convention, San Francisco, Cal., June 7-11. Secretary, T. C. Martin, 29 West Thirty-ninth Street, New York, N. Y.

Minnesota Electrical Contractors' Association. Semi-annual meeting, Duluth, Minn., June 10. Secretary, G. M. Jones, 14 Seventh Street, N., Minneapolis, Minn.

Electrical Supply Jobbers' Association. Summer meeting, Hotel Statler, Detroit, Mich., June 15-17. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

Association of Railway Telegraph Superintendents. Annual meeting, Rochester, N. Y., June 22-25. Secretary, P. W. Drew, 112 West Adams Street, Chicago, Ill.

Society for the Promotion of Engineering Education. Annual meeting, Ames, Iowa, June 22-25. Secretary, F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

Michigan Section, National Electric Light Association. Annual convention cruise, Steamer *Rochester*, June 26 to 30. Secretary, Herbert Silvester, 18 Washington Avenue, Detroit, Mich.

National Electrical Contractors' Association of the United States. Fifteenth annual convention, San Francisco, Cal., July 21-24. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y.

Association of Iron and Steel Electrical Engineers. Annual convention, Hotel Statler, Detroit, Mich., September 8-11. Secretary, W. T. Snyder, McKeesport, Pa.

With the Electrical Manufacturers

The Phoenix Glass Company has moved its New York City showrooms to the Victoria Building, 230 Fifth Avenue, corner of Twenty-seventh Street.

The Fibre Conduit Company, Orangeburg, N. Y., has issued a new price list of Orangeburg fiber conduit. This covers not only the straight lengths, but also elbows, tees, bends, caps, crosses, etc.

R. L. Lunt, Minneapolis, Minn., has opened a new office at 125 South Tenth Street in that city and will act as the representative of the Northwest Mechanical Appliance Company, of Milwaukee, Wis., and the Electric Products Company, of Cleveland, O.

The Diamond State Fibre Company, Elsmere, Del., has moved its Chicago factory into larger quarters and now has four times as much space as before for the manufacture of fiber, machined and punched specialties of every description.

Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill., has issued a neatly prepared and well illustrated booklet on Benjamin automobile accessories. Included among these devices are various types of horns, push-buttons, switches, hand portable lamps, tool sets, etc.

The Meadows Manufacturing Company, Pontiac, Ill., manufacturer of the Meadows safety electric washer, has some interesting information available respecting sales campaigns of particular interest to managers of central stations, electrical contractors and supply dealers. This information will be furnished upon request to the company.

Holophane Works of General Electric Company, Cleveland, O., has issued a folder intended to promote quick sales of Ivanhoe fixtures for 100-watt, type C Mazda lamps. These are single-unit fixtures made up in a variety of styles with either prismatic or various types of opal glassware. Data and prices of the various fixtures are included.

Burchwell Manufacturing Company, St. Louis, Mo., has prepared a pamphlet of various types of "Bright-Eye" electric lanterns which it manufactures. These are arranged to use one or two ordinary No. 6 dry cells and may be used as ordinary portable lanterns or with simple attachments as table lamps or headlights or as exploring and examination lamps.

Belden Manufacturing Company, Twenty-third Street and Western Avenue, Chicago, Ill., has issued price list No. 155 giving discounts and base prices effective April 29 and applying to Belden catalog No. 6. A supplement applying to 20-cent and 21-cent base prices of Beldenite rubber-covered wires has also been issued as an appendix to catalog No. 6.

The Cutler-Hammer Manufacturing Company has issued through its New York City works (144th Street and Southern Boulevard) an illustrated folder on sectional-unit battery-charging control equipments. These have been used with much success in a number of large New York, Brooklyn, Boston and other electric vehicle garages. Their advantages are pointed

cut, particularly the manner in which units may be added from time to time to meet the increasing demands.

Betts & Betts Corporation, 256 West 55th Street, New York City, has recently closed contracts for furnishing and installing its electric clock system in the following schools: Earl Gray School, Winnipeg, Manitoba, Canada; Grant School, Westfield, N. J.; Palmyra High School, Palmyra, Pa. The firm is issuing this month bulletin No. 97 describing in detail the Yerkes playing electric bells and chimes, to which reference has been made in recent issues of the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, particularly the issue of April 10, 1915.

Metropolitan Engineering Company, Forty-second Street Building, New York City, has issued a new bulletin on protective reactance coils. This publication reviews the general practice regarding the installation of these protective devices in generator leads, busbars, feeders, etc. A new type of reactor that is mutually inductive is described, also the semiporcelain-clad reactance coils. This bulletin is very completely illustrated with views of typical reactor installations, details of the coils and diagrams showing the method of connecting, etc.

Main Electric Manufacturing Company, Pittsburgh, Pa., has issued a well illustrated catalog (No. 20) of Main isolated electric lighting and power plants. The sets include an internal-combustion engine, a generator, storage battery and simple switchboard. These plants are made in various sizes to meet the varying requirements of farm, country-house and small-town installations. The catalog shows some plants as high as 325 horsepower. Electrical fixtures, motors, stoves, ranges and other appliances suitable for use in such plants are also described and illustrated.

Drake-Clapp Electric Company, 217 West Fourth Street, Los Angeles, Cal., has been organized by the association of A. Garfield Drake, formerly with the Woodill & Hulse Electric Company, Jean G. Drake, auditor of the Long Beach Bath House & Amusement Company, and Ralph B. Clapp, formerly with the Westinghouse Electric & Manufacturing Company. The new organization has equipped and stocked a thoroughly up-to-date electrical store directly across from the Angelus Hotel, where it is prepared to handle a very attractive line of electrical merchandise, including everything in heating and household electric appliances.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a revised reprint from *The Electric Journal* containing a series of articles of C. H. Sanderson and H. A. Travers entitled "Switchboards for Alternating-Current Power Stations." This publication (which is No. 1541) contains 135 pages with a multitude of photographic and line illustrations of various types of switchboards and switchboard details. Eight chapters relating to the general subject and to subdivisions of it are included. This publication is one that should prove of much value to the designer of power stations and also to the operator.

The United States Light & Heating Company, Niagara Falls, N. Y., has issued a new (fifth) edition of bulletin No. 102 which is devoted to USL storage batteries for pleasure and commercial electric vehicles. This is an unusually complete publication and gives a large mass of data respecting the sizes, capacities at various discharge rates, details of assemblies in pleasure and commercial cars, and other valuable information connected with the various types of these batteries. Included also are prices of the various parts of these sets and accessories. The bulletin is of exceptional value to garage men, battery distributors and manufacturers of electric vehicles.

Kerr Turbine Company, Wellsville, N. Y., announces that recent sales include the following: City of Atlantic City, N. J., 18-million-gallon Economy turbopump; City of Baltimore, 500-kilowatt turbogenerator; City of Williamsport, Pa., 425-horsepower turbine for driving a pump; City of Youngstown, O., two 250-kilowatt turbo-alternators; dredge *Columbia,* Portland, Ore., two 100-horsepower geared turbines; Swift & Company, Chicago, three turbine units; Christian Moerlein Brewing Company, Cincinnati, 300-kilowatt turbogenerator; Carnegie Steel Company, Farrell, Pa., 125-horsepower turbine; Jones & Laughlin Steel Company, Woodlawn, Pa., 325-horsepower turbine; National Tube Company, McKeesport, Pa., 350-horsepower turbine. Export shipments have been made to Groves, England; Birkenhead, England, and Armour de la Plata, Argentine.

The Dover Manufacturing Company, Canal Dover, O., has issued the A-Best-O textbook, which contains technical information and valuable selling arguments for salesmen and dealers of the company's A-Best-O automatic electric irons. The construction of these devices is explained in detail with the aid of numerous illustrations. The characteristic feature of this device is that it contains an automatic thermostatic switch which cuts the current off and on in order to maintain the heat at any desired temperature. The manner in which this iron may be inverted in a special stand and used as a stove is also described and illustrated. The method of testing the outfit is explained. The advantages of using this type of iron are clearly set forth. The book has been prepared in a simple style so that it may be readily understood by those not technically trained and yet it gives detailed information which will permit a salesman or dealer of these devices to understand their construction thoroughly.

Record of Electrical Patents

Issued by the United States Patent Office, May 4, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,137,729. Electric Motor. H. E. Adams, Fort Worth, Tex. Interconnected angularly displaced field windings and brushes so placed on the commutator as to bring different windings of armature successively into action.

1,137,752. Apparatus for Curing or Artificially Aging Cigars. G. E. Goldstein, Montreal, Que., Canada. Includes electric water heater and electrical control of the air temperature and moisture.

1,137,773. Detachable Lamp. J. E. Marsden, Philadelphia, Pa. Lamp supported in globe by conducting portions at ends of globe, through which connections are made with lamp.

1,137,804. Vehicle Control. E. A. Sperry, Brooklyn, N. Y. Electrically controlled speed-changing mechanism.

1,137,821. Testing Device. J. W. White, assignor to Aero Fire Alarm Co., New York, N. Y. Means for simultaneously testing all of the normally independent alarm circuits.

1,137,822. Speedometer. F. A. Wieland, Chicago, Ill. Speeds indicated by different colored electric lights.

1,137,831. Electric Lighting System for Automobiles. J. Bijur, New York, N. Y. Automatic voltage and current regulation of head and side lights.

1,137,834. Apparatus for Cutting, Welding and Brazing Metals. F. M. Bowers, Chester, Pa. Oxygen blast at point of the electrode.

1,137,840. Overload and Reverse-Current Relay. F. Conrad, assignor to Westinghouse Electric & Mfg. Co. Has magnet and disk with spiral contour which presents increasing area to pole face as it moves from initial position; this movement is opposed by a torque which varies as the electromagnetic force which it opposes.

1,137,848. Electric Locomotive. G. M. Eaton, assignor to Westinghouse Electric & Mfg. Co. Relates to the frame and motor support.

1,137,853. Insulating Tube Machine. C. LeG. Fortescue, assignor to Westinghouse Electric & Mfg. Co. Arrangement of forming rolls.

1,137,865. Telephone System. E. E. Kleinschmidt, New York, N. Y., assignor to Hall Switch & Signal Co. Selective switches operated by combination of direct current and reversals of current.

1,137,866. Method of Regulating the Speed of Alternating-Current Motors. O. Knöpfli, assignor to Wagner Electric Mfg. Co., St. Louis, Mo. Simultaneously varying the phase impressed on the primary and the ratio of a transformer between exciting brushes and the stator winding.

1,137,873. Metering System. P. M. Lincoln, assignor to Westinghouse Electric & Mfg. Co. A circuit-breaker is controlled by both an indicating wattmeter and an integrating wattmeter.

1,137,875. Switch. O. E. McCoy, Baltimore, Md. Details of spring contact.

1,137,882. Speed-Control Device for Vehicles. W. S. Menden, Brooklyn, N. Y., assignor to Megosin Co. A source of current varying with speed operates a speed regulator: speed limits are varied by resistance in circuit of regulator.

1,137,894. Printing-Telegraph Sending Apparatus. F. D. Pearne, Chicago, Ill., assignor one-half to J. E. Martine. Circuit-restoring means independent of the key.

1,137,906. Suspension Device. A. Rosenberg, New York, N. Y. Angularly adjustable electrolier support.

1,137,908. Centrifugal Circuit-Breaker. C. F. Rumold, Berea, Ky. Speed-controlled liquid switch.

1,137,929. Telautographic Apparatus. G. S. Tiffany, assignor to Gray National Telautograph Co., New York, N. Y. Pen control through variable-strength currents in tracer lines.

1,137,931. Cable-Armor Joint. W. P. Traver and L. F. Theis, San Francisco, Cal. Clamping and bolting arrangement for sleeve joint.

1,137,953. Ordnance. D. J. Cartwright, Boston, Mass. Electric control system for heavy gun.

1,137,954. Lighting Fixture. J. R. Cravath, Chicago, Ill. Arrangement of reflectors for suspension semi-direct fixture.

1,137,964. Method of and Means for Producing Electrically Charged Particles. R. H. Goddard, Worcester, Mass. By impact with other charged particles in a confined space.

1,137,965. Frequency-Meter. P. Gordon, Barre, Vt., assignor of one-half to A. Estee. Rate of vibration of element is compared with rate of revolution of revolving member of known speed.

1,137,986. Process of Producing and Protecting Insulating Coverings of Oxide on Wires, Bands, Etc. E. W. Kuttner, Ber-

lin, Germany. Oxidizing wire containing aluminum after coiling and covering with mechanically resistant coating.

1,138,013. **Composite Electric Signaling System.** W. W. Phinney, Boston, Mass. Combination of sound and electric waves.

1,138,029. **Signal Device.** S. T. Warner, New York, N. Y. Electromagnetically controlled automobile signal.

1,138,074. **Connector.** W. A. Bonnell, Brooklyn, N. Y. For outlet boxes. (See cut.)

1,138,089. **Method and Means for Statistical Accounting.** W. J. Crumpton, assignor to W. R. Heath, Buffalo, N. Y. Several operations electrically controlled from a common keyboard.

1,138,113. **X-Ray Apparatus.** S. T. Hutton, assignor to Scheidel-Western X-Ray Coil Co., Chicago, Ill. Relates to the rectifying switch.

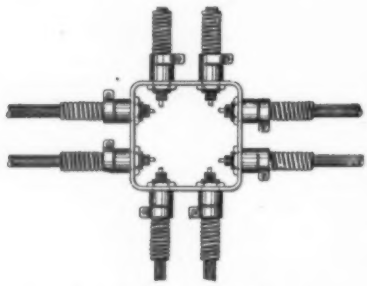
1,138,122. **Electric Motor Vehicle.** F. A. Lambert, Lawrence, and F. Hardy, Andover, Mass. Particular way of mounting battery.

1,138,124. **Indicator.** D. O. Lawrence, Columbus, Neb., assignor of one-third to C. J. Garlow, and one-third to C. J. Cottingham. Electromagnetically operated.

1,138,147. **Method of Tuning Telephone Receivers.** H. J. Power, Everett, Mass. Varies degree of saturation of cores of receiver magnet and maintains reluctance of magnetic circuit approximately constant.

1,138,154. **Electric-Resistance Welding.** A. M. Stanley, assignor to General Electric Co. Has preparatory and welding electrodes.

1,138,162 and 1,138,163. **Vapor Electric Device.** E. Weintraub, assignor to General Electric Co. Mercury-vapor lamp with tungsten anode and silica envelope. Second patent describes method of operating by dissipating heat at cathode to raise critical value of current at which voltage rises abruptly and maintaining the operating current just below this critical value.



No. 1,138,074.—Outlet-Box Connector.

1,138,170. **Transformer-Protector.** O. B. Allgood, Blocton, Ala., assignor of one-half to J. W. Groves, Birmingham, Ala. Tripping device for circuit-breaker.

1,138,174. **Telephone-Exchange System.** G. Babcock, assignor to Telechronometer Co., Rochester, N. Y. Message meter operated by reverse current.

1,138,175. **Telephone System.** G. Babcock assignor to Telechronometer Co. Message meter controlled by shunt.

1,138,184. **Suspension Device for Trolley Wires.** G. H. Bolus, assignor to Ohio Brass Co., Mansfield, O. Flexible suspension.

1,138,186. **Grounding Device.** L. S. Brach, New York, N. Y. For imbedding in the earth.

1,138,212. **Electric Switch.** J. H. Hall, assignor to Electric Controller & Mfg. Co., Cleveland, O. Electromagnetically operated.

1,138,220. **Storage Battery.** R. Hurley, assignor to J. C. Farr, Jr., Hoboken, N. J. Has a double shell and copper and zinc amalgams constituting electrodes on walls of the shells.

1,138,221. **Electrolyte.** R. Hurley, assignor to J. C. Farr, Jr. Sulphates of lead and zinc, and sulphuric acid.

1,138,222. **Individual or Group Cutouts for Electrical Devices.** Chas. Johnston and Claude Johnston, Memphis, Tenn. Connection of branch circuit controlled by current in main circuit.

1,138,224. **Electrical-Switch Key.** W. Kaisling, assignor to Kellogg Switchboard & Supply Co., Chicago, Ill. Has plungers, each of which alternately inserts a conductor and insulation between spring contacts.

1,138,254. **Dynamo-Electric Machine.** O. F. Sire, Paris, France. Sectionalized coil has translatory movement in fixed magnetic field and brushes bear on rings connected to the sections.

1,138,255. **Intercommunicating Telephone System.** H. T. Slee, Warwick, R. I. Arrangement of test board.

1,138,258. **High-Tension Electric Terminal.** A. A. Stupe, assignor to Kellogg Switchboard & Supply Co. Interlocking terminal members, each connected to a conductor.

1,138,269. **Mine or the Like.** S. G. Wigelius, assignor to A. Anderson, Stockholm, and T. Carlander, Gottenborg, Sweden. Electric means for pumping water governing the extent of immersion.

1,138,279. **Trolley Contact.** A. H. Caven, Youngwood, Pa. Trolley switch in which wheel engages one contact plate before leaving the other.

1,138,283. **Telephone Call Register.** W. G. Dodge and C. H. Leave, Boston, Mass. Controlled by receiver hook and central through grounded side of line.

1,138,286. **Dynamo-Electric Machinery.** L. V. Grillet and J. B. Truchetet, Paris, France. Brushes removed from commutator by sliding latter axially.

1,138,287. **Safety Switch for Electric Train Controls.** R. Hamlen, Oakland, Cal., assignor of four-tenths to G. Tate. In controller circuit and operated according to air supply to the brake valve.

1,138,292 and 1,138,293. **Locking Lamp.** H. Hubbell, Bridgeport, Conn. Lamp base has an inner shell secured to bulb, an outer shell turning on inner and screwing into socket, and pawl securing the shells together for one direction of rotation. Second patent modification. (See cut.)

1,138,297. **Electric Socket and Shade-Holder.** G. P. Knapp, assignor to Harvey Hubbell, Inc., Bridgeport, Conn. Shade-holder has lugs entering recesses in socket body and secured therein by cap having bosses engaging recesses.

1,138,299. **Electrical Driving System.** H. C. Leake, assignor to Vickers Sons & Maxim, Westminster, England. Constant-current motor controlled by a shunt across its terminals.

1,138,341. **System of Distribution.** R. E. Williamson, assignor to Allis-Chalmers Mfg. Co., Milwaukee, Wis. Resistance in generator field circuit controlled by solenoid, which in turn is controlled by series of electromagnets in main circuit.

1,138,349. **Automatic Train-Controlling Device.** A. L. Bower, Boyertown, Pa. Fragile conductor on train in the operating circuit is broken by stationary arm when in stop position.

1,138,361. **Signal Device for Vehicles.** J. C. Edwards, Mobile, Ala. Electrically illuminated and controlled direction-indicating plates.

1,138,362. **Heating Device.** C. E. Egan and W. E. Mayer, Cincinnati, O. Thermostatically controlled electric igniter for the burner.

1,138,363. **Primary Battery.** D. Elmes, assignor to New Jersey Patent Co., West Orange, N. J. Has plate with portions of different thicknesses. Energy expenditure can be noted by noting the portions eaten away.

1,138,366. **Safety Limit Switch.** H. A. Everett, Haddon Heights, N. J. Has a weight-controlled latch holding the switch blade, which is biased to safety.

1,138,372. **Spark Plug.** J. A. Gilbert, Cocoa, Fla. Special arrangement of sparking points and construction of insulation.

1,138,389. **Attachment for Telephone Transmitters.** T. Luby, Philadelphia, Pa., assignor of one-half to M. Rothschild. Has a closure for the mouthpiece.

1,138,390. **Oscillating Fan.** E. Marelli, Milan, Italy. Rack and pinion on fixed and movable parts driven by the fan motor.

1,138,400. **Apparatus for Electrolysis of Alkaline Chlorides.** K. Ochs, assignor to Siemens & Halske, A. G., Siemensstadt, Germany. Liquid container and porous diaphragm with partitions preventing bodily movement of liquid adjacent to diaphragm.

1,138,406. **Electrically Operated Time Switch.** J. W. Pennewill and M. R. Buchanan, Silver City, N. Mex. Clutch permits relative movement of contact arm and operating shaft and particular form of quick break.

1,138,441. **Trouble Detector for Spark Plugs.** G. M. Beard, Pleasant Lake, Ind. Connects test gap of greater length in parallel with spark-plug gap.

1,138,445. **Terminal Connection for Spark Plugs.** J. P. Blauvelt, Nyack, N. Y. Has a return bend embracing nut on plug.

1,138,457. **Jar-Molding Machine.** K. O. Dahlmeyer, Berlin, Germany. Electromagnetically actuated table.

1,138,497. **Motor Control Device.** W. S. Menden, assignor to Megosin Co., Brooklyn, N. Y. Car door controls a short-circuit about the motor.

1,138,503. **Lamp.** W. F. Persons, assignor to the Guide Motor Lamp Mfg. Co. Cleveland, O. Bulb for headlight has lower part colored and roughened to prevent reflection upwardly from lower part of reflector.

1,138,512. **Sparking Device for Engines.** W. M. Stempel, Fort Madison, Iowa. Interrupter and spark coil mounted on plug.

1,138,513. **Electric Meter.** W. M. Stempel, State College, Pa. Retardation decreases as load increases.

1,138,519 and 1,138,520. **Process of Manufacturing Peroxide of Hydrogen.** W. Weber, assignor to Henkel & Co., Dusseldorf, Germany. Electrolytic processes employing copper amalgam and silver amalgam as cathodes.

1,138,522. **Electrical Ignition Apparatus.** E. C. Wilcox, assignor to Connecticut Telephone & Electric Co., Meriden, Conn. Interrupter parts arranged as a unit removable from operating cam.

1,138,542. **Fishing Device.** D. Conekin, St. Petersburg, Fla. Tubular outrigger on boat carries electric lamp and lens in downwardly directed branch tube.

1,138,543. **Signaling Apparatus.** H. C. Davis, New York, N. Y., and E. Chadwick, Winchester, Mass. Operated by a watchman's clock.

1,138,552. **Illuminating Mirror.** W. B. Goddard, Cleveland, O. Lamp behind shaving mirror throws light onto concave reflecting surface of casing around mirror.

1,138,569. **Ignition System.** D. B. Hughes, assignor to Citizens Savings & Trust Co., Cleveland, O. Particular arrangement of magneto, coils, plugs, etc.

1,138,577. **Controlling Device for Use in Automobiles.** V. Lancia, Turin, Italy. Controllers for vehicle circuits operated by devices mounted on steering wheel.

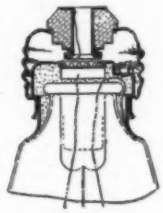
1,138,589. **Check-Controlled Apparatus.** W. L. Hamilton, assignor to Scott Paper Co., Philadelphia, Pa. Coin causes circuit of operating motor to be closed.

Patents Expired.

The following United States electrical patents expired on May 10, 1915:

603,623. Conduit-Wiring Machine. W. E. Cowan, Brooklyn, N. Y.

603,624. Electric Railway. E. C. Crocker, Bridgeport, Conn.



No. 1,138,292.—Locking Lamp.

603,625. Electric Railway. E. C. Crocker and E. C. Howe, Bridgeport, Conn.

603,630. Electric Arc Lamp. F. A. Gilbert, Brookline and E. O. Lundin, Beachmont, Mass.

603,650. Automatic Electric Feed-Water Regulator. A. E. Maccoun and J. Noey, Braddock, Pa.

603,672. Trolley Device for Electric-Railway Cars. L. E. Walkins, Springfield, Mass.

603,681. Throw-Off Switch for Telephones. N. Eallek, San Francisco, Cal.

603,687. Electric Arc Lamp. J. H. J. Haines, New York, N. Y.

603,696. Automatic Temperature-Regulating Apparatus. W. B. Loring, Worcester, Mass.

603,705. Electric Incandescent Lamp. W. J. Phelps, Chicago, Ill.

603,709. Dynamo and Motor. F. Schwedtmann, St. Louis, Mo.

603,722. Electric Condenser. C. S. Bradley, Avon, N. Y.

603,745. Underground Conduit for Electric Conductors. C. H. Sewall, Chicago, Ill.

603,786. Electrically Controlled Switch. E. M. Hewlett, Schenectady, N. Y.

603,815. Electrotherapeutic Apparatus. G. G. Duke, Chicago, Ill.

603,849. Switch for Electric Motors. F. E. Herdman, Winnetka, Ill.

603,875. Electrical Apparatus for Schools. M. E. Crowell, Indianapolis, Ind.

603,882. Electric Lantern. F. G. W. J. Adams, London, England.

603,886. Electrical Steering Apparatus. H. O. F. Bindemann, Madrid, Spain.

603,890. Primary Element with Regenerable Negative Electrode. O. R. E. von Burgwall and L. Ofenschüsl, Vienna, Austria-Hungary.

603,927. Means for Suspending Motors on Vehicles. S. H. Short, Cleveland, O.

603,991. Cable Stringer. F. A. Cannon, Denver, Colo.